THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. X. Nº. 216—13th YEAR.] LONDON, JANUARY 29, 1861. [Subscription per Ann. 15s. in Advance 18s Credit.] Price 8d. Unstamped.

CANNEL COAL.

RAMSAY'S NEWCASTLE CANNEL was discovered by the Advertiser in 1818. Cannel Coal was then little used in London: after surmounting much opposition, it has become the principal Cannel Coal used in the Metropolis, and has greatly assisted in improving the London gas. Its joint products of gas of high illuminating power, and coke of good quality, make it one of the most economical coals known. It is used by all the London Gas Companies, as well as by many Provincial and Foreign. The Crystal Palace was lighted from it in 1851, and the Post-office, Bank, and *Times* Office, are at present.

FIRE-CLAY RETORTS.

FIRE-BRICKS of all descriptions. Manufactory established in 1804.

RAMSAY'S GARESFIELD COAL and COKE.

Bone and Artificial Manures of all kinds.

Address G. H. RAMSAY, Offices, Broad-chare, Newcastle-on-Tyne.

April 27, 1854.

WANTED, in a first-class Manufactory, a person thoroughly acquainted (in all its branches) with the MANUFACTURE of DRY GAS-METERS. A good practical knowledge of the mixing and preparing of the Valve Metal indispensable.

Applications, enclosing references and wages required, to be addressed to X. Y. Z., Office of the JOURNAL OF GAS LIGHTING, Bolt Court, FLEET STREET.

WISBECH GAS-WORKS.

THE Directors of the Wisbech Gas-light and Coke Company Limited, require the services of a RESIDENT MANAGER on the 31st of March next, and are prepared to receive applications from persons thoroughly qualified, by practical experience, for the situation.

The Manager will be expected to take the entire charge of the plant and works, to keep the accounts and books, to collect all moneys due to the Company, and to perform such other duties as usually devolve upon Managers of Gas-Works.

Security in an amount to be agreed upon, will have to be given.

Applications, stating age and salary required, with Testimonials of character and fitness, to be delivered to me on or before the 22nd of February next.

EDWARD H. JACKSON,
Clerk to the Company.

Wisbech, Jan. 21, 1861,

DORCHESTER GAS AND COKE COMPANY.

WANTED, on the 31st day of March next, a MANAGER and SUPERINTENDENT, competent to keep the accounts and books of the Company, and possessed of a thorough knowledge of gas engineering, fitting, &c. He will be required to collect all bills due to the Society, and must give the usual security. He will have a house free, and be found in Coals and Gas.

Applications, stating age, salary required, and other particulars, with testimonials of character and fitness, to be sent in sealed covers, post free, addressed "To the Directors of the Dorchester Gas and Coke Company, Gas-Works, DORCHESTER," on or before the 6th day of February next. The present make of Gas is about 10,000,000 cubic feet per annum.

Dorchester, Jan. 10, 1861.

OXFORD GASLIGHT AND COKE COMPANY.

THE Directors of this Company are desirous of receiving TENDERS for the supply and erection of a TELESCOPE GASHOLDER, 40 feet in diameter, with Columns, Girders, Guides, &c.

Plan and Specification may be seen at the Company's Works after the 22nd inst.

Sealed Tenders, addressed to the CHAIRMAN of the Directors, endorsed "Tender for Gasholder," on or before the 2nd of February next.

The lowest or any Tender not necessarily accepted.

COWEN'S PATENT FIRE-CLAY RETORTS

JOSEPH COWEN and CO.,
BLAYDON BURN, NEAR NEWCASTLE-ON-TYNE,

Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS RETORTS and OTHER OBJECTS in FIRE CLAY."

J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts in the United Kingdom; and orders for Fire-Clay Retorts of all shapes and dimensions, Fire Bricks, and every other article in Fire Clay, are promptly executed at their Works as above.

COWEN'S GARESFIELD COAL AND COKE.
Coal and Coke Office,
QUAY SIDE, NEWCASTLE-ON-TYNE.

FIRST PRIZE IN THE PARIS EXHIBITION.

JOHN RUSSELL AND CO.,
THE OLD TUBE WORKS,
CHURCH HILL, WEDNESBURY;
ALMA WORKS,
WALSALL, STAFFORDSHIRE:
and 69, UPPER THAMES STREET, LONDON,
Original Manufacturers of Wrought-Iron Gas Tubes, and Holders of the present Patents; Inventors and First Makers of LAP-WELDED FLUES for Steam Boilers.

J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water, and the largest Orders may be executed in a few days.

Gun Metal, and all other kinds of Cocks, Stocks, Dies, and Taps, Galvanised Tubes, &c.

N.B. All Goods thoroughly Tested before sent out, and Warranted.

ON COAL GAS,
BY
THE REV. W. R. BOWDITCH.
Post 8vo., Cloth 2s. 6d.
JOHN VAN VOORST, 1, PATERNOSTER ROW.

THE NEW PATENT RETORT BED.

ONE-THIRD of Furnace Fuel saved in short Retort Beds. In double Furnace Beds a saving of Fuel, and all Furnace Smoke burnt. A Six-Bed of Retorts can be changed at once into a Three or Two-Bed, &c.; and other sized Retorts Beds can also be altered when working or down. The Fire playing on the back and side walls, and covering arch in common settings is, by a patent mode, permeating on larger sized retorts. An effectual method secured for destroying the incrustation of Carbon in Clay Retorts. The patent Retorts and Furnaces are more easily repaired than the common settings.

Prices, Plans, &c., obtained from GEO. WALCOTT, 24, Abchurch Lane, LONDON.

French Patent for Sale.—Gas-Works Bought.

COUNTY and General Gas Consumers COMPANY (LIMITED).—Works at Chertsey, Lea Bridge, Northfleet, Pembroke, Pembroke Dock, Ware, and Walton-on-Thames, producing a gas rental of about £6500 per annum.

Established for the erection of gas-works in provincial towns, or the purchase or leasing of existing works on equitable terms. Application to be made to the Engineer to the Company, Mr. H. P. STEPHENSON, 58, PALL MALL.

BLAYDON BURN AND LOW BENWELL FIRE-CLAY RETORT AND FIRE-BRICK WORKS, NEAR NEWCASTLE-ON-TYNE.

WILLIAM COCHRAN CARR begs most respectfully to thank the Metropolitan, Provincial, and Continental Gas Companies for their patronage for several years past, and to intimate that he has rebuilt and enlarged his extensive premises for the Manufacture of CLAY RETORTS; and that he is now prepared to execute the largest orders with punctuality and despatch. Orders for FIRE-CLAY RETORTS, of all shapes and sizes, FIRE-BRICKS, and all other Articles in Fire-Clay, executed on the shortest notice, and on the most reasonable terms.

London Agents:
JAMES LAWRIE & CO.,
63, OLD BROAD STREET, CITY, LONDON.

INSPECTOR.—A young man (23) wishes for an engagement as an Inspector. He is well acquainted with the construction and management of Meters, the laying of Mains and Services, and the arrangement of Fittings and Burners.

Applications to be addressed to Mr. J. O. N. RUTTER, Black Rock, BRIGHTON.

TO GASHOLDER & IRON ROOF BUILDERS.

BOROUGH of SALFORD.—The Gas Committee of the Borough of Salford are prepared to receive TENDERS for the supply and erection, on their No. 1 Station, Lamb Lane, Salford, of a TELESCOPE GASHOLDER, 100 feet diameter, and in two lifts, each 28 feet deep.

Also a WROUGHT-IRON ROOF, 191 feet long, and 77 feet span.

Plans and Specifications may be seen, and any further information obtained, on application to Mr. G. T. HALLS, the Manager on the Works.

Printed forms of Tender will be provided, which must be filled up, endorsed, and delivered at the Gas-Works, Lamb Lane, SALFORD, on or before Tuesday, February 19, 1861.

By order,
GEORGE BRETT, Town-Clerk.
Lamb Lane, Salford, Jan. 23, 1861.

TO ENGINEERS AND CONTRACTORS.

NOTICE is hereby given that the LLANDOVERY GAS COMPANY (Limited), are desirous of receiving TENDERS for the Erection of GAS-WORKS, with all necessary Meters, Mains, and Fittings, to be erected in or adjoining to the Town of Llandovery, in the county of Carmarthen.

Such Tenders to be sent to me, the undersigned, in writing, prepaid, on or before the 15th of February next.

The Company do not pledge themselves to accept the lowest or any other Tender.

WILLIAM MORGAN, Secretary.
Stone Street, Llandovery, Jan. 16, 1861.

TO GAS COMPANIES AND PROPRIETORS.

WANTED, the entire or partial MANAGEMENT of a Provincial Gas-Work, or LEASE of one; or the Advertiser would advance £500 to £1000 to enlarge any existing Work, and take proportionate profit and share of management.

Address by letter to A. B. B., care of Messrs. CHEVALIER and Co., 12, Bell Yard, Temple Bar, LONDON.

TO GAS OR WATER COMPANIES.

WANTED, by a highly respectable, energetic young man, who has a general and thorough knowledge of Drawing, a Situation as MECHANICAL or other INSPECTOR; is practically acquainted with Main Laying, Services, Meters, and fitting up public and private buildings with Gas and Water.

Address W. M., care of Mr. SHAW, 50, Charles Street, WESTMINSTER.

WOLVERHAMPTON RETORT WORKS
ESTABLISHED 1840.

JOHN EUNSON & SON,

Gas Engineers, and Manufacturers of Clay Retorts

AND FIRE GOODS IN GENERAL,

WOLVERHAMPTON.

Retort Mouthpieces, Bolts, Nuts, and every description of Wrought-Iron Work.

JOURNAL GAS LIGHTING ONE PENNY WEEKLY NEWSPAPER

WANTED, a permanent Situation as FITTER and METER REPAIRER. Has a thorough knowledge of main and service laying.
Direct, Y. Z., Mr. Johnson, 10, Willington Place, Love Lane, Windsor, BERKS.

GAS PURIFIERS FOR SALE.

THE Committee of Management of the GREENOCK GAS-WORKS have for sale (deliverable in April next) FOUR DRY LIME PURIFIERS, each 13 feet 4 inches long, 8 feet 2 inches broad, and 4 feet 6 inches deep (inside measurements), with connexions, four tier of malleable iron sieves, wrought-iron covers, and lifting-crane; for all which they will be glad to receive Tenders. The purifiers are in excellent condition, are in constant use, and are to be parted with solely because the committee intend to procure others of a larger size.
Further particulars may be obtained on application to the MANAGER, by whom Tenders will be received till March 1, 1861.
The Committee do not bind themselves to accept the highest or any Tender.
ALEXANDER RITCHIE, Manager.
Gas-Works, Greenock, Jan. 12, 1861.

F. SIMMONDS and SON,
RETORT AND BOILER-SETTERS,
AND CONTRACTORS FOR GAS-WORKS IN GENERAL, FOR MATERIALS AND LABOUR, OR LABOUR ONLY.
OFFICE:
2, YORK PLACE, KINGSLAND ROAD, N.E.
Contractors at the Chartered Gas-Works, Curtain Road, and numerous Provincial Gas-Works.

TO GAS COMPANIES, &c.

FOR SALE.—A Second-hand Cast- IRON TANK (good as new), 35 feet 6 inches by 12 feet deep, with Seven Cast-Iron Columns; 6-inch Inlet and Outlet Pipes complete.
Apply to GEORGE CUTLER and Co., 8, Wharf, Wenlock Road, City Road, LONDON.

TO PROVINCIAL GAS COMPANIES.

A respectable person, who thoroughly understands testing Meters, and who is now holding an office of trust, is desirous of obtaining a Situation as CLERK, COLLECTOR, and INSPECTOR. First-class references and security given.
Address F. N., 318, REGENT STREET, W.

LOANS ON DEBENTURE BONDS.

THE Directors of the South Stafford- SHIRE WATER-WORKS COMPANY are prepared to receive TENDERS for LOANS on Debenture Bonds, to pay off those falling due.
Proposals, stating amount, rate of interest, and period for which offered, to be addressed to the SECRETARY of the Company, at their Offices, Bridgman Place, WALSALL.
J. CHURCHILL, Secretary.
Walsall, Nov. 6, 1860.

TO GAS COMPANIES AND CONTRACTORS.

FOR Sale, several lengths of Hydraulic MAIN, 14 inches diameter and 6 feet 9 inches long, with 7 holes for DIP-PIPES.
Also 4-inch ASCENSION-PIPES, and 3-inch ARCH and DIP-PIPES, and RETORT MOUTHPIECES, all in excellent condition, and will be sold at a very low price, and delivered, if required, at any Railway Station in London.
To be seen, on application to the ENGINEER, at the Equitable Gas Company's Works, Lupus Street, PIMLICO.

Just Published, price 3s., by Post, 3s. 2d.,

THE CHEMISTRY OF GAS LIGHTING,

with an Appendix containing a description of the different processes for the Manufacture of Colouring Matters from Coal Tar.
Re-arranged and reprinted from the JOURNAL OF GAS LIGHTING.
LONDON: WILLIAM B. KING, 11, BOLT COURT, FLEET STREET, E.C.

TO GAS COMPANIES.

THE Advertiser, a young man, wishes for a Situation as MANAGER of a Gas-Work in a small town. Thoroughly understands the Manufacture and Distribution of Gas in Iron or Clay Retorts, the laying of Mains and Services; fixing, repairing, and registering of Meters; and a knowledge of interior fittings, &c. Is now holding a similar Situation, and can produce good Testimonials from present and previous employers.
Address W. C. W., Gas-Works, Tullow, COUNTY CARLOW.

EDWIN DIXON,

WOLVERHAMPTON PATENT WROUGHT-IRON TUBE WORKS,
Originally established in 1833,
Manufacturer of Gas and other Tubes, Fittings, and articles of every description belonging to Gas, Water, or Steam.

E. D. had the honour of receiving the
PRIZE MEDAL
awarded to this Manufacture by the COUNCIL of the GREAT ENGLISH EXHIBITION of 1851; and from he latter date has supplied many towns exclusively with GALVANIZED and other Tubes for Gas and Water, under GOVERNMENT ENGINEERS.

A City, containing 150,000 inhabitants,
has recently been entirely supplied with Tubes made at the above-named Works, and several others with populations nearly as great; in fact, the reputation now acquired induces this notice to the public.
Large Stocks generally on hand, averaging from one to three hundred thousand feet.

HYDRAULIC PRESS TUBES,
to resist 6000 lbs. and upwards to the square inch, extensively manufactured.

STOCK DIES and SCREWING TACKLE
of the best possible descripton.
Every Tube carefully tested with Hydraulic Pressure before leaving the Works.

THE IMPERIAL IRON TUBE COMPANY,

(SUCCESSORS TO GEORGE B. LLOYD & CO.,)
GAS STREET AND BERKLEY STREET,
BIRMINGHAM,
Manufacturers of Wrought-Iron Tubes and Fittings,
FOR GAS, STEAM, AND WATER.
PATENT GLASS ENAMELLED AND GALVANIZED TUBES,
AND
LAP-WELDED IRON BOILER TUBES.

IMPORTANT TO GAS COMPANIES.

By Her Majesty's Royal Letters Patent.

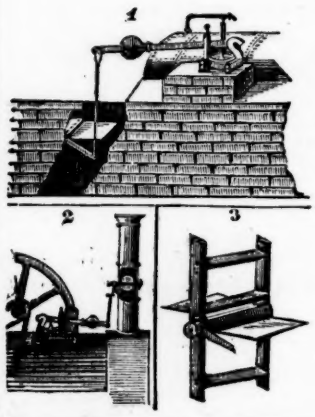
PATRONIZED BY THE LORDS COMMISSIONERS OF THE ADMIRALTY.

R. BARRETT & CO.,

STEAM DAMPER AND FIRE REGULATOR.

CHARLES ROBERTS, AGENT, 17, GRACECHURCH STREET, LONDON.

(TAYLOR AND WEBSTER'S PATENT.)



This Apparatus, from its simplicity of construction, can be easily affixed by any engineer; and, in addition to its being a preventive of boiler explosions, will effect a saving of about 15 to 20 per cent. in fuel. It is suitable for all descriptions of boilers, and can be applied to any at present in use. The following Engineers of Gas Companies have adopted them, of whom reports may be had upon application:—

Imperial Gas Company,	Haggerston,	Mr. Clark, Engineer.
,, ,, ,,	Battle Bridge,	Mr. Methuin, ,,
,, ,, ,,	Fulham,	Mr. Kirkman, ,,
Commercial Gas Company,	Stepney,	Mr. Jones, ,,
Ratcliff Gas Company,	Ratcliff,	Mr. Wilton, ,,
Surrey Consumers,	Rotherhithe,	Mr. Croll, ,,
Equitable Gas Company, Woolwich, Consumers Gas Company, Woolwich,		Mr. Stark, ,,

JOSEPH CLIFF and SON,
FIRE-CLAY WORKS,
WEST DENTON, NEWCASTLE-ON-TYNE,
Manufacturers of Clay Retorts, Fire-Bricks, Lumps Tiles, &c.
The seam of Clay from which these goods are made is noted for its fire-resisting properties. Prices very moderate.
Office, 52, Quay Side, Newcastle-on-Tyne.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of Clay Retorts, Fire Bricks, and every description of Fire Clay Goods.

WILLIAM STEPHENSON & SONS,
THROCKLEY,
NEWCASTLE-ON-TYNE,
MANUFACTURERS OF EVERY DESCRIPTION OF
FIRE BRICKS, CLAY RETORTS, LUMPS, TILES, &c. &c.
LONDON OFFICES:
76, KING WILLIAM STREET, CITY.
A large stock of Fire-Clay Goods always on hand in London, at the lowest wharf prices, at Messrs CHRISTIE & Co.'s Wharf, 64, Bank-side, SOUTHWARK.

STOURBRIDGE FIRE-CLAY WORKS.
E. BAKER and CO.
(Contractors to Government).
24 WHARF, HARROW ROAD, PADDINGTON, W.
Every article manufactured at their own Works and Mines, Brierley Hill.
FIRE-BRICKS, Lumps, Squares, Tiles, and Gas Retorts of all dimensions.
CRUCIBLE and CEMENT CLAYS.
GARDEN EDGINGS, of various patterns.
BUFF and ORNAMENTAL TILES.
CLINKERS and STABLE PAVINGS, noted for hardness and durability, being perfectly non-absorbent.
Shipments on the shortest notice.

JAMES NEWTON,
(Established 1820,)
FIRE-BRICK AND TILE MERCHANT,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON.
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and CLAY, and every Article suitable for
GAS AND WATER WORKS.

HARRIS and PEARSON,
PROPRIETORS OF
BEST CLASS-HOUSE POT AND CRUCIBLE CLAY.
MANUFACTURERS OF
FIRE BRICKS, GAS RETORTS, &c.
AMBLECOTE FIRE CLAY AND BRICK WORKS, STOURBRIDGE.
Late in the occupation of I. and W. King. Originally J. Pidcock, Esq.
NB. A quantity of best Clay Retorts in stock, viz.—Circulars, 14 inches, 15 inches, 16 inches.
D's, 16×12, 15×14, 20×16, 16×18.

BELGIAN CLAY RETORTS.
ALBERT KELLER, Ghent.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Albert Keller, of Ghent, begs to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by him. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.
Communiations, addressed to ALBERT KELLER, GHENT, will receive immediate attention.

EIGHTON MOOR GAS COALS.— Parties wishing to be supplied with these first-class Gas Coals will please to apply to Mr. MATTHEW NESBIT, EIGHTON MOOR OFFICE, NEWCASTLE-UPON-TYNE. These coals are well known as among the richest in gas, and working the roundest on the River Tyne. They are extensively used by metropolitan gas works.

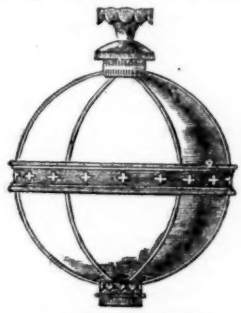
JAMES FERGUSON and CO., Lessees of the Auchinheath and Craignethan Gas Coal-fields (the most extensive and valuable in the parish of Lesmahago), respectfully intimate to the Managers of Gas-Works and Consumers of Gas Coal, that they are prepared to ship the best quality of the above well-known COALS at Glasgow or Leith; and also to deliver them at the railway stations upon, or connected with, the Caledonian Railway, to any extent which may be required.
Price, free on board, or delivered at the railway stations, may be learned by addressing James Ferguson and Co., Gas-Coal Works, Lesmahago.
Shipping Agent for Glasgow:
MR. ALEXANDER STRATTON,
159, WEST GEORGE STREET.

WILLIAM BLEWS AND SONS'
IMPROVED MACHINE-MADE BURNERS,
WROUGHT-IRON BATSWINGS,
FOR RAILWAY STATIONS AND MARKETS,
GAS-FITTINGS, CHANDELIERS,
BRASS AND IRON TUBES OF EVERY KIND,
SUPPLIED ON THE BEST TERMS,
AT THE WORKS,
9, 10, 11, BARTHOLOMEW STREET,
BIRMINGHAM.

CAUTION.
TO GAS-METER MANUFACTURERS AND OTHERS.
THE Undersigned hereby caution Meter Manufacturers and others against infringing the exclusive right of the Undersigned to the use of the Screw Adjustment for regulating the Height of the Overflow-Pipes in Wet Gas-Meters, as described in the Specification of the Letters Patent granted to Crosley and Goldsmith on the 19th of April, 1856: as well as against infringing any other portions of that or any other Patent of the said William Crosley; and
NOTICE is further given, that all Infringers of the said Inventions, or any portions of them, will be proceeded against.
CROSLEY & CO.,
103, SOUTHWARK BRIDGE ROAD,
LONDON, Aug. 29, 1859.

Gas Stoves, Gas Baths, Gas Cooking APPARATUS, warranted the best in England, at PHILLIPS's, the original inventor and manufacturer, and general gas-fitter, &c., 55, Skinner Street, Snow Hill, LONDON, E.C.
PATENT SAFETY ATLAS CHANDELIERS, Sun and Star Burners, Outside Lamps, Patent Reflecting Lamps, Portable Coppers for either Gas or Fuel. Iron Tube and Fittings. Best quality for Gas, Steam, or Hot Water, &c. &c.

GLOBULAR LAMPS,
Ready Glazed, from 17s. 6d. each.



LAMP-POSTS
Of a Superior Class in Stock as well as the Ordinary Descriptions.
Engravings and Prices on application to
WILLIAM HOOD,
12, UPPER THAMES STREET, LONDON.

GAS PURIFYING BY REVIVIFIABLE OXIDE OF MANGANESE.
MR. LAMING (Inventor of the Revivified Oxide of Iron Purification) begs to inform Gas Engineers that they may now supersede the material in general use by A REVIVIFIABLE OXIDE OF MANGANESE of his preparing, which in efficacy is at least equal, and in economy superior, to Oxide of Iron. Owing to the greater chemical activity of Manganese, common dry-lime purifiers of ordinary capacity will often be amply sufficient for it, though they may be too small for the Oxide of Iron material.
For Gas-Works possessing steam power, more especially such as are exposed to public complaint, Mr. Laming recommends the purification to be done either wholly or in part (depending on extent of apparatus) in out-of-doors scrubbers, hermetically sealed, by means of his liquid process, which is both economical, and meets all practical requirements.
118, Fenchurch Street, Aug. 1, 1859.

WALTER MABON, Engineer, ARDWICK IRON WORKS, FAIRFIELD STREET MANCHESTER,
Manufacturer of
IRON TANKS for Gasholders, Railway Stations, &c.
GASHOLDERS.—Extensive premises at Gorton, solely for the manufacture of Gasholders, and other heavy Wrought-Iron Structures.
GAS APPARATUS.—W. M. has an extensive assortment of patterns for Purifiers from 4 feet to 15 feet square, also round ones from 4 feet to 10 feet diameter; Scrubbers, Condensers, Washers, Columns, Girders, and Tripod Patterns, suitable for Gasholders, from 10 feet to 150 feet diameter, either Single-lift or Telescope. Contractor for Gas Works of any Magnitude. Designs, Specifications, and Estimates furnished.
WROUGHT and CAST IRON ROOFS for Railway Stations, Gas Works, Warehouses, and Sheds, prepared for Slates or for Corrugated Iron.
IRON HOUSES, either for Dwellings, Manufactories, or Public Buildings.
PIPES and VALVES, for Gas and Water, from 2 inches to 48 inches bore.

TO GAS COMPANIES.
STOKERS' GLOVES
11s. per Dozen.
S. CARPENTER, 3, BOW COMMON.

GEORGE BOWER,
GAS ENGINEER, MANUFACTURER, AND CONTRACTOR,
ST. NEOT'S, HUNTS.
References to between 100 and 200 Gas-Works Designed and Erected by the Advertiser.

THOMAS W. ALLSOPP,
GAS ENGINEER AND CONTRACTOR.
CASTLE DONINGTON, NEAR DERBY,
Manufacturer of every description of Gas Apparatus, Gasholders, Boilers, &c.

GEORGE CUTLER & CO.,
GAS ENGINEERS, &c.,
London Gasholder and Boiler Works,
8, WHARF, WENLOCK ROAD, CITY ROAD, N.,
LONDON.
Rye, Nov. 12, 1860.
Dear Sirs,—I consider it incumbent on me to acquaint you that the alterations recently made on the Rye Gas-Works—viz., the addition of a NEWLY-IMPROVED WASHER, and other work for the Purification of Gas, executed by the experienced workmen under your able supervision—are perfectly satisfactory to the Company, and the Gas is now as pure as it can be made.
I am, dear Sirs, your obedient servant,
CHARLES THOMAS, Superintendent,
Rye Gas-Works.
Messrs. Cutler and Co.

ROBERT MACLAREN and CO., EGLINTON FOUNDRY, GLASGOW,
Manufacturers of all sizes of Cast-Iron Main Pipes, by an improved Patent. General Ironfounders, Gas Engineers, and Wrought-Iron Tube Makers.

SAMUEL CUTLER, Gasholder MAKER and CONTRACTOR
For Tanks, Roofs, Purifiers, Condensers, Erection and Alteration of Works and every description of GAS APPARATUS.
PROVIDENCE IRON WORKS,
MILL WALL, POPLAR, LONDON, E.
Main Laying and Gas-Works erected complete.

WEST and GREGSON, Gas-Meter MANUFACTURERS, &c.
UNION STREET, OLDHAM.
Station and Experimental Meters, Gas Pressure Registers, Gauges, Experimental Gasholders, Governors, Slide Valves, &c. &c.
W. and G. would respectfully call the attention of Gas Engineers and Managers to their Station-meters, having made and erected the largest in use at the present time, two of which may be seen at the Stockport and Liverpool Gas Works, on application to the respective Engineers.

WHITEHOUSE and CO., Boiler and GASHOLDER MAKERS,
GLOBE PATENT TUBE WORKS,
WEDNESBURY,
Beg to draw the attention of Engineers and Managers of Gas Works to the superior quality of the Article they manufacture, both in respect of the iron employed, and the perfect manner in which it is welded; in proof of which they can refer to the testimonials of the most eminent Gas Engineers, and the experience of the principal of the large Gas Companies of the kingdom.
Orders promptly executed.

TO Mr. BENJAMIN WHITEHOUSE,
GASHOLDER MAKER,
WESTBROMWICH, NEAR BIRMINGHAM.
Sir,—I feel great pleasure in expressing my satisfaction at the manner in which you discharged your duties as CONTRACTOR for the TELESCOPIC GASHOLDER, 150 feet diameter and 60 feet deep, erected at this Company's Nine Elm Station in 1857. From that period to the present I have closely watched its working, and have never found the least defect either in workmanship or material.
During the recent heavy gales the Gasholder, although containing upwards of 1,000,000 cubic feet of Gas, showed no perceptible indications of its influence, but worked as freely and easily as usual.
RICHARD JONES.
Engineer to the London Gaslight Company.
Vauxhall, London, Nov. 9, 1859.

LEONI'S Patent Adamas Gas- BURNERS (secured by Her Majesty's Royal Letters Patent), are entirely free from liability to CORROSION, injury from Heat, or danger of Fracture, and are UNALTERABLE in the dimensions of their Apertures.
Uniformity in the consumption of Gas is obtained by the process of manufacture, which ensures that the Burners shall be of precisely similar pattern.
The Adamas Burners are confidently recommended to Gas-Fitters, Consumers, and Companies.
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TO CORRESPONDENTS.

J. L.—*Square the diameter in feet; multiply by* ·7854, *and the product by the depth of the gasholder, also in feet. The result will give the capacity in cubic feet.*

E. W.—*It is as impossible to predict the duration of the proceedings in winding up the Plumstead, Woolwich, and Charlton Pure Water Company as to fortell the duration of a Chancery suit.*

NOTICES.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 29, 1861.

NOTES UPON PASSING EVENTS.

THE American saying, "Cotton is king," long considered a mere phrase of stump oratory, is coming home to us. We have had a taste—nothing more—of the effect of the failure of an insignificant manufacture during the winter season at Coventry—enough to awaken the money-making and tax-paying public to a sense of the perilous condition of our cotton trade, on which several millions of men, women, and children are directly or indirectly dependent for bread—as workers in cotton factories—as mechanics of machinery—as miners of coal, as navigators of ships—as shopkeepers and journeymen employed and fed by the wages of factory workers. Two-thirds of the raw material, and nearly all the best qualities of cotton, are derived from the United States of America; the rest comes from British India, from Egypt, and, in insignificant quantities, from other parts of the globe. Every other agricultural crop that we know of suffers, from time to time, from unfavourable seasons. But cotton has been so profitable, the enterprise of the Americans so active, the soil of the Republic so wide and rich, that hitherto it has been a constantly increasing crop. The danger of a sudden interruption of the supply has long been foreseen by a few Cassandras of Cottonopolis; but, dazzled by present prosperity, the manufacturers have been deaf to the voice of the prophets of evil. Lancashire, that could find and lose millions on American securities of the most delusive, if not of the most dishonest character, could not find a paltry hundred thousand pounds for the use of the "Cotton Cultivation Society;" yet we heard last week of one family which lost a hundred thousand in American shares and bonds, and yet remains rich. An American railroad engulphed all Mr. Cobden's fortune. It is with the multitude as with individuals, and will be so to the end of the chapter. Necessity only, sets industry and enterprise to work. Not admiration for an ingenious invention—not abstract love of the study of philosophy commenced the Liverpool and Manchester Railroad or Dr. Johnson's Dictionary, but want of conveyance; and want paid employment. The philosophers and enthusiasts who devote the daily labour of a life to the working out of an idea, will always be in a minority. Our merchants and manufacturers see in the intestine divisions of the United States the possibility—nay, the probability—of a servile war, in which, end how it may, the crop of a season may be smothered in the blood of slaves, who will be wanting, when the time comes round, to raise the next crop. The loss will be terrible, if the whites put a black insurrection down at once; but, if they fail—if the insurrection holds ground for a few weeks only—the loss will be total. The actual threatening shadow of a danger, which produced no impression as long as it rested on abstract calculations, has made the Lancashire men put their heads together in consultation, and dip their hands in their pockets. They are men who can do anything (commercially) if they try, and know what to do. All manner of places are suggested as proper fields for filling up the possible void in the American supply, and for supplying the certain demands of our growing trade. Some may be dismissed as likely to take too long in realization, if not purely poetical. To grow cotton of a commercial character requires not only soil and climate, but, first of all, plenty of cheap regular labour. The West Indian Islands grew cotton before they grew sugar, but there are no signs that the free, highly-paid negroes will resume cotton cultivation. Natal, in South Africa, has a favourable soil and climate, and plenty of labourers in the native Zulus. But the Zulus, or Kaffirs, are as much gentlemen in taste as if they were cornets in the Blues waiting for their titles. They will work hard in war or in the chase, or to obtain the means of purchasing an extra wife, but they must have their leisure as well as their amusements, and will not be troubled to work when not in the humour any more than if they were Highland Celts. Thus, a colonist may have a hundred of these stalwart brown gentlemen to-day, but to-morrow, when the cotton is ripe, bursting from the pod and spoiled if not gathered, they will all be away to a dance, a fight, or a hunt, or, perhaps, take it into their heads to have a week of repose. At any rate, wages will not move them to work if not in the humour—as the Highlander says, "*They canna be fashed.*"

Very promising accounts come through missionary sources of the cotton capabilities of native uncolonized and uncolonizable districts of Africa, where labour is plentiful, and barter well understood. These will be worth trying and developing by British consuls and every commercial means, but it is difficult to have confidence in any great production implying invested capital in a barbarous region, open to the onslaughts of the tribes of the interior, who prefer plunder to work. The colonists of Queen's Land, late Moreton Bay, who are settled in a country where both soil and climate are peculiarly suitable for growing the finest quality of cotton, and who have founded all their wealth and their independence on the fine wool of the merino sheep, are sanguine that they can make Lancashire inde-

pendent of the American Slave States. Their plans are based upon a large importation of Chinese Coolies. As these Queen's Land Australians are men of capital and of education, no doubt they will try the experiment boldly and thoroughly, for they are anxious, in some way, to rival the gold and copper colonies, and go ahead of the parent state, New South Wales. But when it is considered that the soil on which the cotton crops are to be sown is as yet virgin, that the buildings and machinery required are as yet not even drawn on paper, that roads are entirely wanting, and that greatest obstacle of all, the labourers, who are to break up, till, and sow, and gather the crops, have not, up to this hour, been even engaged in China, it must be admitted that the prospects of Queen's Land Cotton are very remote; still more remote when it is remembered that the wages of a shepherd in Australia are equal to at least £50 a year; that the Chinese, by hundreds, are gold-seekers in New South Wales, as well as shepherds in Queen's Land; that these extraordinary people have not only a mysterious means of inter-communicating information, but a great facility in acquiring the English language, supposing it possible to find the ships and the passage-money for a hundred thousand Chinese, and the capital for cultivating a hundred thousand acres—a mere spot in the Lancashire demand. How long would free Chinese labourers consent to work at cotton-planting for low wages, when high wages and gold-seeking tempted them to other pursuits, if not to other colonies?

The Queen's Land men do right to make the experiment, but the manufacturers can scarcely afford to wait for Queen's Land cotton. There is one country ready to our hand, where labour, soil, and climate only await the encouragement of English capital and English machinery, where the people—docile, needy, industrious, fond of money—have little to learn in the arts of growing and preparing the invaluable staple, and are willing to be taught if sure to be paid. That country is British India, which only needs works of conveyance and works of irrigation to grow cotton and the food for the cotton growers, as well as other scarcely less valuable produce, in quantities only limited by price, with the certainty that the more we consume of raw produce, the more the Indian peasantry will purchase of our manufactures. But Indian works are at a dead lock. Indian finances are in such a state that the local government dare not venture on the responsibility of borrowing, at the Indian rate of interest, the millions required for completing the essential works of navigation, roads, railroads, bridges, irrigation, planned and in progress. It is not disputed that eight or ten millions might be so invested as to produce interest, on the safest possible security, at a rate almost unknown in Europe. It is not disputed that the prosperity these works would produce amongst the native population of India would very rapidly turn a deficient into a surplus revenue, and make whole districts prosperous, paying double and treble their present rent or taxes. It is not disputed that, by judicious works of land and water conveyance, the production of the cotton districts—that is, not only the districts which now grow cotton, but the districts that would, if they had a market—could be almost indefinitely increased. The obstacle to a financial arrangement, which would enable the money to be borrowed under British guarantee at 3½ per cent. which costs 5 per cent. under an Indian guarantee, is a maxim of high finance and rigid political economy. We need not stop to inquire whether the maxim is sound and true. It will save time to admit its soundness as a rule. But this case of Indian cotton supply, coupled with the chronic deficit in the Indian finances, is clearly a case for exceptional treatment. We guaranteed the first Canadian loan after the Canadian rebellion had been put down. We joined in guaranteeing that Turkish loan, so miserably squandered, after the close of the Crimean war. As matters go on at present, insolvency is a much more formidable enemy of our Indian empire than a black insurrection or Russian invasion.

There is no such false economy as expending money on public works by driblets. Private enterprise has undertaken to expend fifty millions on railway extensions at home within the next five years. A loan guaranteed by England to complete the works in hand and unfinished in India, would be the best investment England could politically and commercially undertake. The guarantee would be purely nominal. The result would tell at once on both sides of the water, and would do all that can be done humanly to protect the cotton manufacturing districts from the horrors of a failure in the American supply. The amount would not interfere with private enterprise at home; it might compete with foreign loans. It was contrary to all the laws of political economy to feed the Irish during the famine and pay them for making roads, often ill planned, always ill executed, and in many cases utterly useless. But exceptions must prevail in great emergencies. The Irish exception saved the remnant of the people. Are we to wait until the condition of the cotton-factory districts is equally famine-stricken, and until India stops payment, and collapses in bankruptcy? Here is something real for the M.P.s' to do who signed the military retrenchment round-robin to Lord Palmerston—something that would very soon remove that 10 per cent. at the British Indian Custom-Houses, which very naturally vexes the peace of the Manchester men, while rejoicing over the conclusion of the French treaty.

The Government of New South Wales have adopted the system of American Street Railways for a district of Sydney, and actually ordered the carriages in England from Mr. Train. In the colony of Queen's Land, a committee has been formed for the purpose of establishing "a Moreton Bay Tramway Company," with a capital of £150,000. The project arises out of a recommendation of a committee of the First Legislative council "on the internal communications of the colony." It was considered "that the nature of the colony presented insuperable obstacles to the construction of railways;" and the committee concluded that "a good substantial tramway would be the cheapest mode of communication, where no insuperable obstacles prevailed." Timber of a suitable kind being plentiful along the line of the intended routes, the cost is estimated at £1700 per mile, and it is proposed to lay out the first £30,000 in eighteen months, and the second in the following twelve months; the Government is to give the company an acre of land adjoining the line for every £1 laid out, and allow the company the use of the line for twenty-one years, on condition of carrying the Government mails free. At the end of that term, the line and rolling stock are to become the property of the Government. To these terms the Executive have agreed. Of course, the tramways are to be worked by horse power. Altogether, this young colony seems fortunate in its Government and its colonists. Roads, telegraphs, and steamboats, seem their chief care, rather than the political place-hunting contests which are tearing the older and wealthier colonies to pieces.

Additional importance has been given to the Metropolitan Transit Company by the Corporation of London having given Mr. Train permission to bring one of his lines through the Corporation territory, by Finsbury Square and Moorgate Street to the Bank, on condition that he remove it at any time at his own expense on receiving a month's notice. This resolution was adopted on the strength of a favourable report from Mr. W. Haywood, the engineer and surveyor of the Corporation, who, having charge of the City pavement, must be much puzzled to satisfy the demands of a traffic that constantly increases through streets that cannot be widened. The branch to the Bank will test to the utmost the utility of horse railways. If they answer there, they will soon cover the rest of the metropolis, sometimes feeding, sometimes competing with, the quarter-of-a-million-a-mile under-ground railways. Four bills were entered at the private bill office for carrying out the additions and extensions of the Metropolitan Railway described in our last "Notes:"—"1. A metropolitan railway improvement of communication with the Great Northern Railway and Metropolitan Meat Market; 2, Extension to Finsbury Circus; 3, Extension to Bayswater and South Kensington; 4, Establishing an independent company for constructing a railway from the Regent Circus to join the Metropolitan Railway at Smithfield." But King Discount, like a financial King Herod, came in and slaughtered all the western extensions except that to Hammersmith; smothered the Piccadilly junction, and frightened the Regent's Canal Railway project out of the field.

In looking over the new links proposed to be joined to the termini of the London Railways, it seems as if the London and North-Western was the most torpid and indifferent to the advantage of a central passenger station, and the development of its suburban traffic. The only attempt is the bill for a high-level branch from the North-London, terminating in Liverpool Street, City, which, as at present planned, cannot unite with the Finsbury Circus Station. The rivalry of the Great Northern and the Great Western will become very formidable to Euston Square Station, when they tap Pimlico at one end and Blackfriars Bridge at the other. The bill for carrying on an embankment, a low-level sewer, a road, and a railroad, on

the plans of Messrs. Fowler, Fulton, and Hemans, is curious from its comprehensiveness in a diplomatic as well as in an engineering point of view. The projectors have not only wisely made use of the lines, plans, and experience of Mr. Walker, Mr. Page, and Mr. Lionel Gisborne, but have endeavoured to conciliate and obtain contributions from the Commissioners of Woods and Forests, the Metropolitan Board of Works, and all the great railway companies on both sides of the river. The objects of the bill are—"1. An embankment on the left bank of the Thames, to commence at the north side of the Middlesex end of Westminster Bridge, and to terminate at the west side of the Middlesex end of Blackfriars Bridge. 2. A roadway running along the embankment, and terminating in or near New Bridge Street, Blackfriars, with approaches from Whitehall and Waterloo Bridge. 3. A railway commencing at Westminster Bridge, running along the embankment, and terminating by a junction with the London, Chatham, and Dover Railway, at Blackfriars Bridge." By clause 22, an ordinarily obstructive official department is conciliated, for it is made "lawful for the Commissioners of Woods and Forests, &c., to contribute such a sum of money as shall be sufficient to satisfy all claims for compensation in respect of land required or affected by the undertaking;" and, in return, all the land not required for the embankment is to be vested in the commissioners, or to be used or sold by them for the repayment of their advances. Clause 23 authorizes the Metropolitan Board of Works to contribute a sum not exceeding £400,000 to the undertaking, in consideration of which the board may construct the main outfall sewer under the embankment, and the company being bound to construct a road 80 feet wide, well paved with footways on each side. Thus, the engineer of the Metropolitan Board will have the satisfaction of carrying out an important part of his main drainage plan in the most convenient manner, without the extra labour of designing and superintending the embankment—no small advantage to an officer paid by fixed salary, and not hitherto engaged in designing works of such magnitude and importance. Clause 25 authorizes the London, Chatham, and Dover, the London and North-Western, the Great Northern, the Eastern Counties, the South-Eastern, and South-Western Railway Companies to subscribe to the undertaking, to the extent of £50,000 each. If this bill should pass, the railway cannot stop at Westminster Bridge—some means will be found of uniting it to the Kensington extensions of the West London Railway, and thus form an important section of a metropolitan circle of iron roads.

Mr. Charles Burn published last year a second edition of his pamphlet, "On the Construction of Horse Railways," which contains a number of facts and suggestions likely to be very useful now that the necessity of finding some mode of conveyance less costly than that of a perfect railroad, and more swift and comprehensive than a common road, as we showed in our last "Notes," seems generally acknowledged at home and in our most thriving colonies. Mr. Burn's introductory reasons for preferring the continental system to our own, we take to be altogether fallacious; but he is not the first man who has recommended a good thing with a very bad introduction. Mr. Burn observes very truly, that there are many large agricultural districts, and numerous small towns and villages in England, ten to twenty miles distant "from a railway station." A landowner twenty miles from a railway station must pay at least 10s. a ton for all goods transported to and from the railway; and there are many turnpike roads communicating with two large towns in the manufacturing districts, with continuous houses throughout their entire length. "Suppose two towns ten miles apart, with railway communication running near and parallel to the road, and having a station half way between the towns, many of the inhabitants would have 2½ miles to walk to the station. The average distance would be 1¼ mile. Taking that distance to be done in twenty minutes, ten minutes on an average to wait for the train, ten minutes to go five miles to either terminus, the passenger would thus consume forty minutes on the journey. If, however, he could be transported from his own door by a vehicle drawn at the rate of eight miles an hour to the nearest town, 3¾ miles distant, he would only consume thirty minutes, consequently he would save ten minutes time and 1¼ mile walk." And Mr. Burn might have added, that the vehicle would set him down in the main street of the town, while the railway station would probably be in the suburbs. In a word, the railway not only accommodates the inhabitants living in the neighbourhood of the termini, but those living between them.

Provided horse railroads could, for considerable lengths, be laid down on established but at present deserted roads, a saving, No. 1, would be made in the cost of land, and of permanent way, to a certain extent; saving, No. 2, in the non-necessity for numerous stations, with their goods sheds, and other building appurtenances; saving, No. 3, would be in speed. A locomotive railroad in England must travel, according to custom, at from twenty to twenty-five miles an hour. Eight miles an hour for passengers, and three miles an hour for goods, would be quite fast enough for cheap horse railroads, forming branches or auxiliaries of main lines. There is no doubt that horses can work at low speeds, and draw light loads more cheaply than locomotives. It has been found that on the broad guage line great loss is incurred in working the goods traffic of rural stations, because each station cannot find merchandise enough to fill a truck, and as to be continually impacking and repacking is consumptive of time and labour, the steam elephant is constantly drawing more weight in trucks than in goods that pay for conveyance. The evil exists, although to a less extent, on the narrow guage lines. A couple of horses driven tandem, the best system for horse railways, will draw comfortably eight tons on rails, fifty passengers and an omnibus would weigh six tons. Two omnibuses and four horses will thus carry 100 passengers on a horse railroad. The cost of the carriage and horses will be about £600. Mr. Burn puts the cost of locomotive engines and carriages to carry 100 passengers, at £2500, and the cost of a tramway for horse power, with rolling stock, at £2500 per mile, against £10,000, the average cost of branch single lines. All this sounds very well, and the next thing we want to see is a specimen of a hundred miles or so of horse railways tried in suitable lengths, on two or three of our great deserted roads, where the telegraphic poles are being put up without hindrance from the trustees.

Mr. Burn gives a chapter to the Street Railways of America. In New York they have five roads, and in 1858 conveyed 27,000,000 passengers. In 1859, they conveyed, per mile of double track, 700,000 passengers. The receipts were £8000 per mile, three times more than the Eastern Counties, twice as much as the Great Western, and half as much again as the London and North-Western. Opposition, jobbery, and other mysterious expenses, seem as costly in New York as in England's worst time, for this cheap tramway cost £22,000 a mile, including rolling-stock; and, no doubt, what in America is called "log-rolling"—viz., the profits of the parties in a Society for Mutual Plunder. On the Avenue Railway, in New York, they carry 50 passengers in thirty minutes, or at the rate of 10 miles an hour. On the Third Avenue Railway, 6½ miles long, they carry 17,000 passengers daily, at the uniform rate of 2½d. each. Some of the omnibuses carry 100 passengers, and travel with two horses, at the rate of 5 miles per mile. They run on lower wheels than ordinary omnibuses, are roomy inside—seven feet high—and are fitted up with every regard to the comfort of ladies, who would not ride in ordinary omnibuses. Mr. Burn gives several French and other estimates for horse railways, but as these are shortly to be seen in operation, it is not worth while to publish what must be superseded by actual data. He also discusses the advantages of diminishing the gauge of these common road railways, a proposition which every year's and every day's experience proves to be a mistake. The goods traffic in country districts will be of more consequence than the passenger traffic; and, for a goods railway, a break of gauge is an unpardonable folly. In towns, a uniform gauge will permit street railways to be used at night in feeding and distributing the goods traffic of the locomotive lines.

We cannot pass over without notice Mr. Burn's introductory chapter, in which he expatiates on the same text that occupied a leader in the *Times* last Friday—the cost of constructing and working our English railroads—the evils of competition, and the superiority of the French and German systems *in the matter of dividends!* In the matter of dividends, there is no doubt that the shareholders in the continental railroads, which are planned much more for the advantage of the shareholders than the public, enjoy a decided advantage over those who have made original or premium investments in many English lines. But, in a national point, it will be easy to show that the advantage lies with our system. It is a waste of time to dwell long on the cost of our early lines, when railroads were considered by country gentlemen as destroying

demons, and by capitalists as mines of inexhaustible wealth. We had to sink and lose a certain amount of capital in making experiments, another large share in conciliating public opinion, and a third in our costly parliamentary contests. Mr. Locke and other English engineers took to the continent all the results of our experiments at a time when those experiments had shown to Governments accustomed to do everything *for* the people, and not *by* the people, that railroads were good things. We might just as well complain that we were saddled with old tubs of steamboats, while foreign nations had the best bran new steam-ships from London and Glasgow yards, as complain that our early lines cost a great deal more than those executed abroad by decree of Ministers of Public Works.

As to the Parliamentary Private Bill system, it is full of defects, uncertain, blind, and costly; but no one has ever suggested any plan that would work better, as a whole, in this country of representative Government, where the intelligence of private enterprise so far exceeds the talent and the experience of officials. Wisdom and power united produce very grand results: but what are the results of folly in power? Robert Stephenson or Joseph Locke Dictator, might have done fair things; but imagine what commerce would have suffered under Edwin Chadwick? Mr. Burn says "we cannot but think that if Government had laid down the chief lines of railways, and only granted permission to construct those lines the net revenue of which could be proved, from the then existing traffic, to return at least 5 per cent. upon the outlay, we should have avoided the waste of capital in constructing useless competing lines and unprofitable branches, and that our railways would pay at least 8 per cent." This is the cant of mole-blind investors who would establish a despotism to-morrow to get 1 per cent. more on their money. In the first place, where was the officer to be found who was competent, twelve or fourteen years ago, to settle the railway wants of England? We have had a series of officers in the Railway Department of the Board of Trade, from Sir John Burgoyne downwards, all remarkable for their helpless ignorance of railway matters. Captain Galton is, perhaps, the best; but he was young enough, wise enough, and clever enough to try to learn his new business. A Government officer did arbitrate between four competing lines to Brighton, and chose the very worst of all—the most expensive and the least accommodating to the line of route and to Brighton. The idea of ascertaining the resources of traffic, before constructing a line, is a fallacy exploded even in Parliamentary committees. The wild notion made that celebrated traffic-taker, Mr. Humphrey Brown, a member of Parliament. We do not know anything else it ever did. We may improve and localize our inquiries on private bills; but we have not, and it is to be hoped we never shall have, any Government department charged with the task of finding out what is good for the English people to undertake, and preventing rash investments. The end is always unlucky. In foreign mines, where the rope, and wheel, and corve system of descending was forbidden, lest the rope should break and the miners be killed, hundreds were annually ruptured in climbing up and down by lines of ladders. But much of this lamentation over useless branches and low dividends is premature. In the first place, as we have before argued, we have such a complete system of railway network as no other country enjoys—a facility of communication which has been a principal agent in the enormous increase of our exports, imports, consumption, and increased value of agriculture, building, and mining property. Whole districts of France and Germany are as far from markets as Aberdeenshire was a century ago. In France, there are great tracks of land that have actually fallen out of cultivation within the last fifteen years. The French rural and commercial economists continually refer with envy and admiration, in their writings, to the results of private enterprise in English means of conveyance. There is no axiom in politics more certain than that you must take the good with the bad—the abuses with the advantages. A free Parliament, trial by jury, a free press—all have their disadvantages; and so have public works of private enterprise. If English undertakings are not dry-nursed by Government, neither do they get anything from Government, except a load of taxes. But there is another important point, of which the Utopian worshippers of 10 per cent. dividends lose sight. There is in every series of prosperous years a large surplus of English profits to be invested: experience has shown that these profits will be invested somewhere. When canals were exhausted and railroads not invented, in 1824-'5, capital flowed away to Greece, to South America, to Spain, and to the United States. The rash railroad expenditure of 1840 to 1848, besides covering the land with cheap, rapid conveyance for merchandise, poured into the pockets of the landed interest—who had suffered so severely from mortgages and charges incurred in paper money and paid in gold—funds which they invested in farm buildings, drainage, and other agricultural improvements, which may, in 1860, be contemplated with a degree of satisfaction not attendant on an examination of Spanish bonds or South American mining shares. Besides, it is very difficult to say what are useless branches, and what railroads won't pay. The principal lines are rising steadily in receipts and profits. None are useless to the country. Between the working of English and continental lines, it is impossible to draw any comparison. The greatest expense of all is hand labour, which is twice as dear for unskilled labour in this country as in Germany, where working expenses are £900 a mile against our £1500. The minimum number of trains, the minimum number of carriages, a low rate of speed, the fewest possible porters, policemen, and signal men, and a close monopoly, are the foundation of the low working expenses, and the profits on foreign railways. They are in great part railroads for pleasure, not business purposes—cheap for passengers, dear for goods. Our habits demand speed, attention, frequent trains. Again, the more the network is crossed, the greater the danger of accidents—the greater number of pointsmen, signalmen, policemen, required. At present, railroads are constructed as cheaply in England, probably more cheaply, considering their solidity, than in any other country in the world. The average cost of 5566 miles of American railroads was £10,746 per mile; and this average includes wretched tracks at £3000 and £4000 a mile. We admit the advantage, and shall always seek to promote wise economy, and to put down idle, reckless competition; but we have no confidence in the judgment of government officials, and prefer seeing British capital invested in British works, leaving the investors to decide on their risks without the use of official spectacles.

MUNICIPAL TRADING.

On several previous occasions, we have felt it to be incumbent upon us to protest against the false political economy, and the great moral injustices which are committed, whenever Municipal Corporations attempt to derive a revenue from the sale of the goods, or the discharge of the services they are enabled to bring into the market, to the exclusion of other competitors, by the aid of the funds they raise by general taxation. The proceedings which have lately taken place at the Southampton Town Council Meeting, with respect to the last district rate for the Local Board of Health of that town, and to the reduction in the charge for water, have brought this question again before the public, in connexion with many other proceedings of the very socialistic body referred to; and, as the principle involved is one of the highest importance to the whole nation—one, moreover, which is likely to arise in other places—we feel that it is desirable to attempt at once to place the discussion of that principle on the most general and philosophical grounds.

At Southampton, and at other places under the paternal care of the Local Government Act Office, the mode of covering the expenses attending the supply of water is by levying a general district rate *on all properties assessable to the poor rate:* then, by a special district rate; and, finally, by a water-rent, charged only on the properties taking the water. It appears that there were some special circumstances connected with the financial position of the town of Southampton, at a period antecedent to the adoption of the Public Health Act, which would render it difficult to say how much of the general and special district rates ought to be charged to the account of the present water supply; but, if we assume that the real amount so raised is only 4d. in the pound, on all the property assessable to the poor rates, we believe that we are taking an unfavourable view of the case for the position we propose hereafter to support. The water-rent at Southampton is, under shelter of this district rating, kept at 2d. in the pound on the houses supplied; and, latterly, the price for water supplied for trade purposes has been reduced from 1s. to 9d. per 1000 gallons, the quantity being ascertained by meter, the consumer keeping the meter in repair.

Now, unquestionably, the householder who receives the water he requires at a rate which is only 2½ per cent. on his assessed rental, gets his supply at a cheaper rate than he

would do if he dwelt in a town where water, being supplied by a trading company, was charged for at a price which would enable that particular service to pay for itself. As a general rule, water cannot be distributed in a town like Southampton at a lower rate than 5 per cent. on the rental; and it can only, in this particular case, be supplied at the lower rate by making property, which derives no benefit from the water supply, contribute largely to the district rating. To quote some of the most striking instances of this unjust method of taxing one part of the community for the benefit of the favoured class, we may mention that the Dock Company, the Railway Company, the Gas-Works, and even, we believe, the Floating Bridge, as being assessable for the relief of the poor, are liable to pay the 4d. district rate, though we more than question whether either of those bodies is able to derive much benefit from the house water-rate; and we are sure that, for trade purposes, it would never be worth their while to purchase water at the rate of even 9d. per 1000 gallons. Eventually, this question resolves itself into one of taxing the rich for the benefit of the poor, and its best defence lies, perhaps, in this fact; but the question then at once arises, why should this be done in a roundabout, and a necessarily expensive, way? The Gas Company, which is unequally taxed in order that the water consumer may have cheap water, is obliged to make this burthen an element in its working expenses, and thus to charge a higher price than it otherwise would do for its gas. The small tradesman who burns gas is the person who, in the end, pays the contribution levied from the gas company; and, by the way, he is compelled to pay, in addition, the cost of collection, and the numerous other incidentals attending such operations. The same reasoning applies to the railway traveller, to every tradesman who receives goods by rail, to every person connected with the shipping and trade of the port; and the fundamental injustice of the whole system attains even the landed property, of an agricultural description, situated within the limits of the rateable district.

It cannot be said that the parties who levy the district rates of Southampton are not aware of the nature and effect of their proceedings, for Mr. Randall, the gentleman who proposed the reduction in the price of water to be sold by meter, expressly stated that he left out of account the capital employed in the town water-works, "because that was provided for by a separate rate;" or, in other words, by a rate raised alike from those who did or did not take the water. But there was this singular mistake in Mr. Randall's subsequent calculations—viz., that whilst he proved that the mere cost of *pumping* the water (so far as the coals and other expenses, which had been grouped by the financiers of the Local Board amongst "the items for rate for water supply," were concerned), had only been 3d. per 1000 gallons, he spoke throughout the discussion as though the cost had been 7d. per 1000 gallons in his experiments. In fact, Mr. Randall included, in his own case, "the cost of steam-engine and other apparatus;" whilst, in the case of the town, he excluded them; and it must be inferred from this that the Local Board of Health must be making a very large profit on all the water it sells at a rate exceeding 3d. per 1000 gallons. From what occurs in other towns, we know that this must be nearly the true state of the case. Where water is pumped in large quantities, after being filtered, the actual cost to the water companies is known to be about 3d. per 1000 gallons, and the additional 3d. per 1000 usually charged is considered to cover the interest on the repairs, and the depreciation of the engines and other apparatus, the rates, charges, and profits of the concern. In London, the charge for trade consumption is 6d. per 1000 gallons, and, in fairness, it should be considerably cheaper at Southampton; for, in the latter case, the general district rate bears many of the charges the London companies support. As it is, the manufacturers of Southampton find themselves in this position, that if they take the water from the Local Board by meter, they have to pay a rate of 4d. in the £1 on their rental, and a sum per 1000 gallons three times greater than the prime cost of the distribution; whereas, if there had been a water company in Southampton for the discharge of this particular municipal function, the manufacturers would not have had to pay the portion of the district rate connected with the first cost of the establishment, and would have received the water at one-third less per 1000 gallons than they even now pay after the late reduction made by the Local Board.

The whole of this story at Southampton, is a curious illustration of the practical results of the system of allowing municipal bodies to undertake the discharge of duties which can be undertaken by private traders. The principles, upon which this system of municipal trading is justified are, that in consequence of the absence of competition, and of certain other causes, which press heavily on private enterprise in these matters, communities can execute the requisite works at a cheaper rate than private individuals, or Companies can do; and moreover, that, when the communities take this class of operations into their own hands, they can supply the articles produced on terms more favourable to the poor than a trading Company would be likely to do. Now, at Southampton it would appear, firstly, that the water-works have cost, since they have been in the hands of the Local Board of Health, about the sum of £56,675; or just double the price at which they were originally estimated; and at a rate per head of the inhabitants in excess of the one which several of the best private Water-Works Companies have succeeded in attaining. Secondly, that every proprietor who pays the poor rate of the Borough, is compelled to pay towards the water-rate, whether he takes water or not. And thirdly, that, for commercial purposes, the sale price of the water is higher than it is in many cases where private Companies undertake the supply. In other words, the practical result of this experiment is, that the housekeeping class is supplied at a lower rate than it ought to be, by means of an unjust system of taxation pressing upon the landed proprietors, and the great industrial undertakings of the town. This system "of robbing Peter to pay Paul" is, no doubt, very acceptable to the parties benefited by the socialistic legerdemain in question; but we contend that every injustice of this kind must, in the end, be injurious to the community which practises it; and, moreover, that whenever the real cost of a public service is disguised by distributing it over parties who are not able to exercise a direct control over its execution, there is always a danger of extravagance in the disposal of the money so raised. In strict justice, and therefore on grounds of true policy, the parties receiving water into their houses ought to pay the whole of the expense of its distribution, as would be the case if the water supply were in the hands of a private company. Had this principle been adopted, it is tolerably certain that the fixed charge on the water supplied by meter (that is to say, the charge for machinery, apparatus, &c.), would not have borne the frightful proportion it now does to the charge for pumping, &c.: so that the destruction of the principle of direct personal interest on the part of the water consumers has only served to open the door to an injudicious outlay on the Water-Works. We have at all times held, and we here emphatically repeat, that whenever by any unfortunate combination of circumstances, a Town Council is allowed to turn trader, it cannot equitably conduct its business, unless it makes every branch of the public service support its own burthens; and, unless it makes those who derive benefit pay the whole charge *pro rata* of their participation in the benefit. The departure from the rules of strict justice, in the case of the Southampton water-rate, has not yet been so flagrant as was the one connected with the sale of gas at Manchester. In principle, however, the two cases are analogous; and, unless the ratepayers of Southampton bestir themselves, they may depend upon it that attempts will be made to extend this system of shifting burthens from those who ought to bear them, to those who are considered by amateur philanthropists, and noisy demagogues, to be more able to pay. Truly, it is a grand thing to be liberal at other people's cost; and, to dilate on the benefits to be conferred on society by a cheap supply of water, is an easy method of exciting the enthusiasm of the non-ratepaying class; but every violation of the laws of strict justice must bring its retribution—remote, perhaps, but inevitable—and the Town Council of Southampton, in particular, would do well to pause in their career of forcing contributions from some classes for the benefit of others. Southampton, of all towns in the south of England, is perhaps the one where it is the most important for the inhabitants to encourage large manufacturing establishments, and every unjust burthen cast upon such undertakings, every unnecessary discouragement thrown upon them (in the way of increasing their working expenses), must be a direct injury to the true interests of the working population. It may be that the class of men, who vote for the Members of Local Boards of Health, do not perceive this elementary economical truth; or, like the Manchester ratepayers, they may for a long time content themselves with the diminution of their own fair

contribution to the public burthens. Manchester has, however, learned by sad experience that it is as true with respect to municipal services, as it is to anything else, that "honesty is the best policy;" and in that town, at the present day, each service has to defray its own budget, or at least to present a clear statement of the manner in which the sale of the articles supplied by the town pays for the expense of supplying them. Fortunately for Southampton, most of the towns on the south coast are suffering under the incubus of the Board of Health, or of the Local Government Acts, and there may thus be little danger of an immediate opposition; but other towns may arise, which may be wise enough to avoid the errors of their predecessors in the race for commercial favour, and to treat private enterprise fairly, so far as local burthens are concerned. Southampton would do well to ponder over these things whilst it is yet time; but, whatever opinion may be arrived at with respect to them, it can neither be right nor wise, on the part of the middle classes of any community, to act unjustly towards the employers of labour, and thus to create a feeling of rival class interests, which would array against them both rich and poor.

Circular to Gas Companies.

The discontented agitators in some of the metropolitan vestries are making themselves busy in devising charges against the gas companies of not conforming with the provisions of the Metropolis Gas Act, and suggestions have been made for the appointment of committees to hunt up grievances. In other vestries, they have been more reasonably occupied in the appointment of examiners of gas, and in carrying out the regulations necessary for putting the Act into operation; but, in the present want of knowledge of the amount of work to be done, it is difficult to prescribe the duties, and fix the remuneration, of the chemical examiners. The vestry of Marylebone apparently anticipate that such an officer will have a sinecure in their parish, for they propose to throw the duty on the officer of health, without any addition to his salary; it being alleged that the parish is now in so healthy a state that he will have plenty of leisure time to test the gas. It would be well if the gas consumers were so satisfied with the purity and the illuminating power of the gas as to render the office of examiner a sinecure, but the antecedents of the parish of Marylebone do not justify such expectation; and, as the subject has been referred to the gas committee, it is probable some arrangement will be made for increasing Dr. R. D. Thompson's salary. In the meantime, the Imperial Company have proposed to the vestry to place an experimental meter in High Street, Camden Town, and another within 1000 yards of their works, at Fulham. The fixing of those instruments for testing the illuminating power of the gas, and the appointment of examiners, are obviously the first things to be done for carrying the provisions of the Act into effect; but, before any testing of the gas has been made, or any practical measures have been taken to ascertain the quantity of gas supplied to the public lamps, some of the parish agitators are reiterating the former complaint, that the price paid for the public lights exceeds the price charged to private consumers. It is asserted, on mere speculation, that an appeal to arbitration would reduce the present charge for gas to the street lamps 25 per cent.; and that by such an application of the provisions of the recent Act a saving would be made, sufficient, in the first year, to defray the whole cost of passing that measure. We can well understand why such assertions are put forth at the present time, when the parishes are called on to pay the expenses incurred. They are intended to gild the pill which the ratepayers are compelled to swallow, by making it appear that the money now taken out of their pockets will be amply repaid by savings in years to come. It was, indeed, on such pretence that the vestries and district boards were, in the first instance, induced to vote away the parishioners money to pay for the proceedings of the gas inquiry. The managers, it will be remembered, published tables of returns respecting the public lighting of the metropolis, for the purpose of supporting their statements; but we proved, from those very tables, that, so far from the gas for the public lamps being charged more than that supplied to private consumers, the gas companies would gain £32,000 per annum by assimilating the prices to the private standard. It is worth notice, as a confirmation of that statement, that, after the many strong assertions by Mr. Hughes that the gas companies were defrauding the public of large sums by overcharge for lighting the street lamps, he should remain silent on the subject at a time when some of the companies are claiming their right to raise the contract prices for the supply of gas to an equality with the charge to private consumers. He must either have perceived that his former accusations were erroneous, or he must be neglecting his duty to his constituents to permit such additional charges to be made without loudly raising his voice against them.

Mr. Hughes has, indeed, his own grievances to attend to, which may, perhaps, explain his seeming neglect of public wrongs. He has not only to bear the ingratitude of some of the vestries in negativing a proposed vote of thanks to him and Mr. Beal for their services in obtaining the Metropolis Gas Act, but he has to rebut some unfounded charges made against him of having received money for those services out of the parish rates. It is well known that we have no partiality to Mr. Hughes; therefore, our vindication of him from that unseemly accusation will have more force. There is no evidence whatever to show that he or Mr. Beal received any remuneration for their long-continued and zealous, though injudicious, attempts to injure the metropolitan gas companies; but the reputation which Mr. Hughes has gained of being a clever and active antagonist he may turn to good account, and it will probably be the means of rewarding him for his "honorary" labours. The money he was accused of having received for his parliamentary exertions may be considered as the first-fruits of his hard-earned reputation, for it was the amount of his bill against his own vestry for services rendered in raising the assessment of the Chartered Company. There may be want of delicacy in claiming emolument from the parish whilst he was fulfilling the offices of vestryman and churchwarden; but the charge was openly made for services specifically rendered, and was not a surreptitious reception of money for services which professed to be gratuitous.

Application has been made in the Court of Queen's Bench for a new trial of the action brought against the Creat Central Company for having negligently caused the destruction of the premises in Wood Street by fire. The grounds of the application were—misdirection by the Judge, and that the verdict was against the evidence. The first of these grounds of objection was, however, quickly abandoned, and Lord Chief Justice Cockburn jocosely remarked that he had cause to think the plaintiffs very ungrateful in making such objection, for he had gone to the extreme in summing-up in their favour. Finding that the other judges were disposed to concur with the Lord Chief Justice in that opinion, Mr. Hawkins, the plaintiffs counsel, confined his objections to the evidence, and stated that he was prepared with affidavits from several chemical authorities, who affirmed that it was manifestly dangerous to tap the main with open windows in the basement. On this part of the case, the Judges seemed no more inclined to disturb the verdict than on the first ground; and all that the plaintiffs took by the motion was a rule *nisi*, on payment of costs, to the effect that, if on the other trials relating to the fire in Wood Street a different verdict shall be given than that in the case of Blenkiron against the Great Central, the Court will then hear the arguments of the defendants counsel; but if the verdicts in the other cases should be the same, then the rule *nisi* is to be discharged, and the verdict confirmed. Great preparations are making for the next trial, in which Mr. Morley himself will be the plaintiff. The scientific gentlemen by whom the affidavits were made tc strengthen the application by Mr. Hawkins, will then be brought forward as witnesses, and the plaintiffs, having from the experience of the last trial found out the weak part of their case, will no doubt come into court fortified on those points. The question, however, does not depend on legal adroitness and subtlety, but on plain common sense. The speculations of a host of scientific witnesses, after the explosion, would be of no value in determining the question placed before the jury by the Lord Chief Justice—viz., did the men employed to lay on the service adopt ordinary and reasonable precautions, which *up to that time* had been considered necessary to avoid accident? Had the same scientific gentlemen who—instructed by what has occurred—now come forward to assert that there was manifest danger in tapping the main with windows open in the basement below it, been asked the question before the event, it is more than probable they would have given an opposite opinion. That carburetted hydrogen gas should have entered the windows in such quantity as to become explosive seems, indeed, directly contrary to scientific principles. The

specific gravity of ordinary coal gas, such as is supplied by the City companies, is but little more than half that of atmospheric air; and, on escaping from the main, it would be forced upwards with a pressure of nearly seven pounds to the square inch, while the force with which it was impelled laterally was only one inch of water pressure. The gas, on issuing from the hole in the main, would therefore have an upward tendency 180 times greater than in a lateral direction. With these facts before them, we can imagine that scientific men would have treated with contempt the suggestion of the probability of gas, when acted on so strongly by an upward force, being carried downward by a feeble current of air to supply ventilation. That the gas should have entered through some open window above, even at the top of the building, would have been in accordance with recognized facts; but that it should have descended, would have been deemed almost impossible. Now, however, that such an unlooked-for occurrence has apparently set previous scientific deductions at nought, men of science may, somehow or other, account for the variance of facts from theory; but such speculations have no bearing whatever on the merits of the case. It was attempted by Mr. Hawkins to throw blame on the workmen, because they did not pay attention to the open staircase into the basement, and perceive that it was likely to cause a draught of air from the open windows; but it was very properly observed by the Lord Chief Justice, that the men employed to do such work could not be supposed to be philosophers. If there were anything peculiar in the construction of the building which caused the gas to be drawn in at the basement windows, in opposition to its usual mode of escape into the atmosphere above, it ought not to be imputed to the men that they were guilty of negligence for not having taken a survey of the premises before they commenced their work. The evidence on the late trial showed that the service-layers had taken the ordinary and reasonable precaution which to that time had been considered necessary; and, though the result has proved that such precautions were not sufficient, it is unfair to tax them with neglect because we have become wiser by the event.

The hamlet of Shipley, near Bradford, in Yorkshire, has remained in darkness this winter, in consequence of a dispute between the gas company and the Local Board of Health. The board endeavoured to throw the blame on the directors; and the latter, to exonerate themselves, have published a statement of the case, with copies of the letters that have passed between them. From this statement, it appears that the dispute originated with the delay of the board in paying the gas bill, which was six months overdue; and when the directors pressed for payment, in June last, the local board deducted three guineas from the account on the plea that several of the lamps had not been lighted during some of the preceding winter's nights. This defect was accounted for by the frost, and the directors stated that they had been at considerable expense in thawing the pipes, though the local board were bound by the terms of the contract to keep the upright service pipes in repair. The directors accepted the amount offered under protest, but they refused to remove any future stoppage in the upright pipes. Several letters then passed, in which the board expressed themselves dissatisfied with the lighting of the town, which they required should be improved, and at a less cost. The directors showed, by reference to the charges for public lighting in various towns in the neighbourhood, that Shipley had been lighted at a cheaper rate than any other, taking into consideration the small number of lamps, and their great distance apart. The terms offered by the directors were, to supply each of the lamps with five feet of gas per hour for 1750 hours for 35s., or to supply it by meter on the same conditions as charged to the largest private consumer. To neither of those propositions would the board agree, but they proposed that the charge for 1750 hours consumption from a four-feet burner, should be 26s. for the present season, and be reduced to 23s. the following year. This offer was made in the middle of November, and the result of the attempt to coerce the directors into accepting terms much lower than the former contract has been to leave the inhabitants in darkness.

The bills of the various street railway companies should receive the careful consideration of gas companies, with the view of securing the insertion of provisions, in any Acts that may be passed, whereby their mains may be protected from disturbance or interference, and providing also that the rails shall be laid in such manner as to allow free access to the pipes and branches. One of the schemes contemplates the laying of a rail and pipe combined, the latter ostensibly for the transmission of parcels, but capable of being used for the conveyance of gas or water should the carriage of parcels disappoint the expectations of the promoters. We give *in extenso* a copy of the Bill of the Street Railway Company as a specimen of the whole.

In the provinces, the usual outcry has been got up against gas companies applying to Parliament for statutory powers to carry on their operations. Thus, at Huddersfield, Sowerby Bridge, Elland, Aldershott, and probably elsewhere, the senseless "No-monopoly" cry has been raised, in apparent ignorance that the step is taken to regulate and control the virtual monopoly already existing. The town-clerk of Halifax ought to know better than to lend himself to such an agitation.

We reprint from the Transactions of the Royal Society a paper communicated by the Rev. Mr. Bowditch on the purification of gas, read at the meeting of that body on the 6th ult. We are not yet prepared to express any opinion upon the practicability of applying the process therein described for the conversion of bisulphide of carbon into sulphuretted hydrogen, to the purification of gas upon a large scale; but we are disposed to think that it may be successfully employed on the premises of such consumers as desire gas of greater purity than can be produced by the ordinary processes of purification. We, however, differ from the writer upon many of the views he propounds, and shall take an early opportunity of reverting to the subject.

The judgment of the Court of Queen's Bench in an appeal of the North Staffordshire Railway Company against the assessment of their property in a parish through which that railway passes, is given elsewhere in the columns devoted to Legal Intelligence, as it throws considerable light upon the question of the principles of assessment under the general Act, and more especially from its disallowing the claim for interest and tenants profits upon the capital expended in trade plant not permanently attached to the freehold, but capable of being removed, although intended to be permanently connected with the railway, or certain appendages to it that are essential to its working. Many experienced surveyors and valuers entertain the opinion that such plant should be treated as tenants fixtures, and that the theoretical tenant is entitled to charge interest and profit on the capital expended in their construction. The court has given its judgment against this principle, and henceforward trade fixtures are held to be assessable as well as "hereditaments" within the meaning of the Parochial Assessment Act.

The almost unprecedented severity of the season has directed the attention of managers of gas-works to the employment of glycerine as a substitute for water in filling wet meters and the hydraulic slides of pendants. A paper on the properties of this material, and the mode of preparing it, will be found under the head of Communicated Articles in another column,

A set of dry lime purifiers have been recently erected at the Canterbury Gas-works by Messrs. Edward Cockey and Sons, of Frome, so economical in their construction, and efficient in their operation, and meriting special notice in our columns, that an engraving of them will be found in an adjoining page (see page 63). The form of the original purifying-house required that three vessels, 12 feet by 8 feet, should be erected, instead of four vessels of 8 feet square, which could have been preferred, and a slight increase in expense was created thereby; but, as the supply and erection of the whole apparatus, including the valves, connecting-pipes, and lifting machinery were contracted for at £365, the economy of the construction is evident. This, in some degree, arises from the very ingenious and efficient form of valve patented by the contractors, from which a saving of nearly 50 per cent. upon the cost of the usual slide valve is effected, while the tendency to derangement is considerably reduced. The machinery for lifting the covers is the neatest and most compact of any we have seen, and does great credit to Mr. Esson, of Cheltenham, by whom, we believe, it was first suggested.

Communicated Article.

GLYCERINE.

All ordinary fats, as our readers are probably aware, consist of glycerine united with certain fatty acids, of which the most important is the stearic. In the manufacture of composition or stearine candles, the stearic acid, of which they are formed, is separated from the glycerine by one of several processes. The original

method, and the one still most generally used, consists in acting upon the melted fat with milk of lime, and blowing steam into the mixture until the reaction is completed. By this means, there are formed a hard insoluble soap, and a sweet watery liquid. The stearic acid leaves the glycerine to unite with the lime, so as to form a soap of stearate of lime, while the glycerine displaced by the lime remains in solution, together with a portion of lime. This crude glycerine solution is formed in large quantities. Some portion of it is used for the preparation of purified glycerine, but the great bulk of it is at present thrown away. It is purified as follows:—The free lime which it contains is first carefully neutralized with sulphuric acid, and the whole evaporated down to a syrupy state, whereby the sulphate of lime and other dissolved salts separate out more or less perfectly. The liquid is then decanted off; and, with or without filtration through animal charcoal, is sufficiently pure for use in gas-meters. Glycerine by itself cannot be distilled; but, by means of a large excess of superheated steam blown into it, at a temperature of about 600° F., the operation may be readily performed, and a pure distillate obtained. At Price's Candle Company's Works, the separation of the fatty acids from the glycerine is effected by means of superheated steam. At the temperature of 600° F., the fatty acids separate from the glycerine to unite with basic water, and the hydrated acids and glycerine distil over together, the acids floating on the glycerine solution. In this way, a pure distilled glycerine is at once obtained. When the separation of the stearic and other fatty acids is effected by treatment of the crude fats with sulphuric acid, as practised in many candle factories, the glycerine is completely destroyed. Neither glycerine nor its moderately strong aqueous solutions freeze or evaporate perceptibly within the range of atmospheric temperatures in this country.

Correspondence.

"THE FATHER OF GAS LIGHTING."

SIR,—In your JOURNAL of this date, you refer to the late Samuel Clegg as the "father of gaslighting"—a designation which, with the most entire appreciation of the talents and excellent qualities of the lamented deceased, I submit can properly be claimed only for my father, the late Frederick Albert Winsor, the founder of the Chartered Gaslight and Coke Company.

Mr. Winsor's proposals for lighting towns by coal gas date from 1802. He demonstrated its practicability by so lighting the Lyceum Theatre in 1804; three houses in Pall Mall in 1807; and the whole length of the south side of that street from those houses during the Sessions of Parliament of 1809 and 1810; and his name, as the propounder and demonstrator of this discovery, as applicable to public gas lighting, and of the application of the products obtainable from coal to many useful purposes, appears in almost every page of the evidence taken before the committees of the House of Commons in the last-mentioned years.

On the evidence thus given, an Act of Parliament was passed in 1810 to incorporate the company by charter, which, however, was not actually granted until the 30th of April, 1812. Thus, the first gaslight company that ever had existence, emanated from the labours ("energetically struggling against a host of adversaries," as your article most truly records) of the late F. A. Winsor, the real father of gas lighting.

From the beginning of 1813, and only seven months after the grant of the charter, Mr. Clegg became the engineer of the company. Stations for the erection of gas-works had already been selected, in situations quite unfit for the purpose required; but with this selection neither Mr. Clegg nor my father had any concern, the latter having long before proposed to secure vacant land on the river-side at Blackwall; but all power and influence were wrested from him, though he had sacrificed the best years of his life to establish the company.

Mr. Clegg's education as a practical engineer, with Boulton and Watt, and the advantages which he had derived from his association with Dalton and Murdock (although the latter actually petitioned Parliament against the first gaslight bill) indicated him as possessing the talent necessary for constructing gas-works on a large scale; and, with the reservation which I have felt constrained to make, in common justice to my father's memory, I beg to offer my full and most willing testimony to Mr. Clegg's merit in the introduction of those several parts of the system of works which remain in use to the present day, as well as to the high engineering talent which he displayed both in the invention and construction of other parts of the works and apparatus for generating and distributing coal gas, but which have now been superseded by improvements for which, however, he laid the foundation.

F. A. WINSOR.

Lincoln's-Inn-Fields, Jan. 15, 1861.

SIR,—In your obituary of the 15th inst., I perceive you allude to the recent death of Mr. Clegg—a man, no doubt, who has rendered very great services to his country by his ingenuity and perseverance—but I cannot allow you, without contradiction, to call him the "Father of Gas Lighting."

That title I claim for my late father, William Murdock, and all conversant with the early history of gas lighting have long awarded it to him.

It is unnecessary that I should go into details for substantiating his claim to it; you will find them at full length set forth in the 7th edition of the "Encyclopædia Britannica," article "Gas Lighting."

I would not for a moment wish to lessen the merits of the late Mr. Clegg in the estimation of the public, but I claim, as justly his due, for my late father, the honoured title of "Father of Gas Lighting."

JOHN MURDOCK.

Sycamore Hill, Handsworth, near Birmingham, January 18, 1861.

MR. CROLL AND THE SURREY GAS COMPANY.

SIR,—I have perused the report of the meeting of the Shareholders of the Surrey Gas Company, held on the 31st ult., as published in your JOURNAL of the 15th instant, and I find that in some particulars the same is inaccurate.

By that report, it is made to appear that *Mr. Croll's* memory was at fault, whereas the very reverse is the case, as you will see by perusing the statements sent herewith, one of which is extracted from your report, the other from the short-hand writer's notes, the accuracy of which I can vouch for, having been present at the meeting.

Allow me, therefore, on Mr. Croll's behalf, to request a correction of the inaccuracy in your next impression.

10, *Coleman Street*,
London, January 22, 1861, *E. C.*

THOS. GUYATT.

Extracts from the JOURNAL OF GAS LIGHTING *for the* 15*th of January*, 1861, *page* 40.

16*th par.*—The CHAIRMAN: On the contrary, I appealed to the members, and they did not remember anything of the sort. [Mr. Duval and Mr. Laughton being again appealed to, said it was quite true.] Your own friends say so.

17*th par.*—Mr. DUVAL: I think you said that Mr. Boddy should communicate, and he forgot it.

18*th par.*—After some remarks by Messrs. Black and Laughton on the subject, and considerable interruption in the meeting,

Mr. CROLL rose and said, &c.

Extracts from Short-Hand Notes.

The CHAIRMAN: I appealed to the other members of the board, and they said they remembered no promise of the kind.

Mr. CROLL (appealing to the directors): Is that so?

The CHAIRMAN: I appealed to them myself. They said, "You might have said something about letting Mr. Croll know, but we do not remember your saying anything about sending a letter."

Mr. BOWDITCH: That is quite correct.

Mr. DUVAL: You said Mr. Boddy should communicate with Mr. Croll; upon which you said, "If I said so, I had forgotten it."

Mr. BLACK: I understood the chairman to promise Mr. Croll that Mr. Boddy should communicate with him. That was all that passed; and no communication was made, I think.

Mr. CROLL: That is all the difference. The chairman distinctly promised that Mr. Boddy should write me the result.

Register of New Patents.

1666.—WILLIAM KEMBLE HALL, of 36, Cannon Street, in the City of London, engineer, for "*Improvements in gas-regulators.*" A communication from Calvin J. Herring, of St. Louis, U.S.A. Patent dated July 11, 1860.

The object of this invention is to regulate the flow of gas through pipes, and it consists in the application of thin curved metal plates to the flexible diaphragm of a gas-regulator, so as to impart to the said regulator the sensibility incident to the application of plates thereto, without impairing the extent of its action or its flexibility, as is the case when the plates are made flat, and clamped close to the diaphragm. The chamber of the regulator is made in two parts, joined by screws; the flexible diaphragm is secured at the edge by the joint between the parts of the chamber; the valve-stem passes through a hole in the centre of the diaphragm, and also through holes in the curved plates, and is furnished with screw-nuts, by which the flexible diaphragm and the curved plates are clamped together. The valve at the lower end of the valve-stem is fixed to the lower end, so as to close the orifice from the receiving-pipe. This valve closes or opens as the pressure of the gas may be increased or diminished. When any of the burners supplied by the eduction-pipe are shut off, the pressure of the gas will be increased against the under-side of the diaphragm, and will cause the stem and its valve to be lifted, and partially closed, and thus diminish the flow of gas to the chamber and burners.

If the diaphragm were attached to the valve-stem without the plates, it would fall, and when the gas was admitted, it would puff up and around the stem, thus giving a slow, irregular, and uncertain motion to the regulating-valve; and, if the plates were made flat, and applied close to the diaphragm, it would, when the gas was admitted, assume a crimped form outside the plates, and also give the valve an uneasy and uncertain action. But the objections to flat plates and to the use of a flexible diaphragm without plates, are avoided by employing the plates curved and arranged according to this invention, so that the diaphragm will fold or curl between the plates in rising, as well as around the outside of them.

The claim is for the application of the curved plates to the flexible diaphragm, substantially as described, and for the purpose specified.

1694.—ANDREW STRATHERN, ANDREW STRATHERN the younger, and ALLEN STRATHERN, all of Glasgow, N.B., brass-founders, for "*Improvements in stop-cocks or valves for regulating the flow of fluids.*" Patent dated July 13, 1860.

This invention relates to the arrangement and construction of stop-cocks or valvular apparatus for regulating and controlling the flow or passage of water and other fluids.

Under one modification as adapted to the regulating and controlling the passage of water from the ordinary water service-pipes, the improvements consist of a combination of a stop-cock with what is technically known as a tube-cock or swan neck. In this cock, as ordinarily constructed, the inlet portion of the cock is of a T-shape figure, the water being shut off or let on by the turning of a tubular cock, which is ground into the right

angled end portion of the T-piece. The ends of the tubular cock project out beyond the T-piece, one end having a nut fitted to it, and the other carries a curved tube, through which the water flows. In the ordinary cock, the turning of this tube up or down regulates the flow of water; but, where there is any pressure on the cock, it is very liable to leak at the lateral margins of the T-piece. This indeed is a constant source of annoyance and waste. In the improved combination, the stop-cock is arranged on the upper part of the inlet-pipe, and a short tubular passage rises up from this part at right angles thereto. In the lower part of the inlet, below this opening, is cast a metal diaphragm, which forms the valve-seat. When the aperture in this diaphragm is opened, the water flows up through it and into the tubular end of the T piece. The valve is formed on the end of a vertical spindle, which works out through a convex cap or stuffing-box, secured on to the vertical tubular opening, the spindle terminating in a cross head or actuating handle. A boss is formed on the valve-spindle, on which a screw thread is cut; this part fits a corresponding internal screw tapped in the inner surface of the vertical opening. The convexity of the enclosing cap gives space for the upward movement of the screw-valve spindle, so that when the handle is turned the valve is raised, and the water flows unchecked through the tube. When the handle is turned in the opposite direction, the valve is screwed down, and the pressure of the water is now acting entirely upon the valve. In this way, the tube or swan neck may be left in any position, or removed altogether, being entirely independent of the stop-cock, which alone controls the passage of the water.

These cocks thus offer a security against waste and leakage, which is not furnished by any tube-cock at present in use.

The claim is for—

1. The general arrangement and construction of stop-cocks or valvular apparatus for regulating the flow of liquids as hereinbefore described.

2. The system or mode of combining and regulating valvular apparatus with the ordinary tube-cock, or valve, or swan-neck cock or valve, in which the said valvular arrangement is disposed or placed on the upper part of the cock, as described, or any mere modification of the same.

1734.—Job Goulson, of Ponsonby Terrace, Vauxhall Bridge Road, Westminster, for "*Improvements in gas and other fluid meters.*" Patent dated July 17, 1860.

This invention has for its object improvements in gas and other fluid meters, and relates to the construction of the index-dials of meters, which dials, as at present constructed, being made of opaque material, do not, when the meter is ready for use, admit of the wheelwork of the counting apparatus being examined to see that the wheels have each the proper number of teeth, and are properly placed to register the measurement of the meter correctly. Now this invention has for its object to remedy this defect, and for this purpose a transparent dial of pressed glass is used, with the necessary letters and figures raised upon its face, the letters and figures being coloured or not, as may be preferred. The glass dial serves as front plate of the index wheel's dial-plate, and the arbors of the wheels and pinions pass through, and take their bearing in holes made for their reception in the glass dial.

This invention also relates to a method of maintaining a constant water-level in wet gas-meters. For this purpose, an endless chain of cups is used, which is passed through a tube of suitable form and dimensions, and around two rollers, the lower one of which is placed at the bottom of the tube, and in the centre reservoir. The upper roller is placed at the top, and in the measuring compartment of the meter, or in a chamber in communication therewith. The upper roller gives motion to the chain of cups, being driven by a bevel-wheel placed upon its axis, which bevel-wheel receives its motion from another bevel-wheel fixed upon the index-spindle, which is set in motion by the action of the meter. The tube, through which the chain of cups passes and works, is soldered or otherwise made sound in the partition plate between the measuring compartment and reservoir; and, being closed at its lower end by the water, serves to prevent gas passing from one compartment to the other. The chain cups are made by pressing up small cups in metal, and passing through and soldering small links of chain in the bottom of the cups, and connecting them one with the other.

The cups, as they ascend out of the reservoir, come up full of water which, when at their highest position, they discharge upon the roller, in which is a groove down which it runs, into a spout for its reception, into the upper or measuring compartment of the meter.

The claims are for—

1. The application of glass dial-plates, with the necessary letters and figures pressed on or in the dial-plate of the indexes or counting apparatus of gas or other fluid meters.

2. The application of an endless chain of cups for raising water to maintain a constant water-level in the measuring compartment of wet gas-meters.

1774.—Alphonse René Le Mire Normandy, of Odin Lodge, King's Road, Clapham Park, Surrey, for "*Improvements in connecting gas and other pipes.*" Patent dated July 21, 1860.

This invention has for its object improvements in connecting gas and other pipes. The pipes to which the improved joint is applied are made plain from end to end, *i.e.*, without sockets; and, when two such pipes are laid end to end, a short cylinder, of slightly larger diameter than the pipes to be connected, is slipped over them to the points where the ends meet or come opposite each other. This short cylinder is made at its two ends with sockets or recesses, of larger diameter than the other parts of the cylinder; and it has also flanges at its ends. Into the sockets or recesses, rings of vulcanized indiarubber, or other suitable packing, are introduced, and over these, filling pieces or rings of metal are placed, which enter the sockets or recesses. These filling pieces are furnished with flanges, by means of which they are forced down upon the packing, screw-bolts being employed to draw the flanges or the filling pieces up to the flanges on the cylinder. Other means may be employed for forcing the filling pieces or rings on to the packing, or other means of expanding and pressing it firmly in contact both with the pipes and the covering cylinder may be resorted to.

PROVISIONAL PROTECTION

HAS BEEN GRANTED FOR THE UNDERMENTIONED INVENTIONS.

2836.—Henry Alfred Jowett, C.E., of Sawley, in the co. of Derby, for "*Improvements in the method of heating or firing ovens for the manufacture of pottery and porcelain by means of gas, and in apparatus connected therewith.*" Nov. 19, 1860.

2958.—Richard Edward Keen, of 15, Old Change, London, for "*Improvements in cocks, taps, valves, and other apparatus for stopping and regulating the flow of liquids, steam, and gas.*" Dec. 3, 1860.

3162.—Charles Lizars, of 36, Rue Lafayette, Paris, manufacturer of gas-meters, for "*Improvements in gas-meters.*" Dec. 26, 1860.

6.—William Cooke, of Charing Cross, civil engineer, for "*Improvements in apparatus for ventilating.*" Jan. 2, 1861.

27.—Louis Charles Emile Vial, of Paris, Chemist, for "*Improvements in the manufacture of colouring matters and pigments from coal oil, raw naphthaline, and from the waste lime from gas-works.*" Jan. 5, 1861.

56.—Edward Clarence Shepard, of Victoria Street, Westminster, for "*An improved apparatus for carbonating gas for gas lighting.*" Jan. 9 1861.

95.—Elijah Freeman Prentiss, of Birkenhead, in the co. of Chester, manufacturing chemist, for "*Improved apparatus for regulating the flow of gas, part of which is applicable to the valves of steam-engines.*" A communication. Jan. 12, 1861.

NOTICE HAS BEEN GIVEN OF INTENTION TO PROCEED WITH THE UNDERMENTIONED INVENTIONS.

2210.—Arthur Ransford, of Manchester, brass-finisher, for "*Improvements in galleries or supports for gas shades.*" Sept. 13, 1860.

2220.—Charles Theodule Launay and Auguste Marie Anre Alexandre Dominè de Vernez, both of Paris, gentlemen, for "*Improvements in treating coal naphtha, and in apparatus employed therein.*" Sept. 14, 1860.

2882.—William Renwick Bowditch, of St. Andrew's, Wakefield, York, clerk, for "*Improvements in the purification of coal gas and of coal oils.*" Nov. 24, 1860.

3064.—William Clark, of 53, Chancery Lane, London, engineer and patent agent, for "*Improvements in the manufacture of gas.*" A communication. Dec. 13, 1860.

Parliamentary Intelligence.

STREET RAILWAY COMPANY (LIMITED).

A BILL

To Authorize the "Street Rail Company (Limited)" to lay down Rails for Facilitating the Passage of Traffic upon such of the Streets of the Metropolis, and other Towns of the United Kingdom, as shall be selected with the Consent of the Parties having the Charge of such Streets, and for other Purposes.

[*The words printed in italics are proposed to be inserted in committee.*]

Whereas a joint-stock company, with limitation of the liabilities of the shareholders thereof, has been established under the name of "The Street Rail Company (Limited)," (in this Act called "the company,") and is registered under the Joint-Stock Companies Acts, with the object of laying down iron rails and plates upon such of the streets and roads of the metropolis, and other towns of the United Kingdom, as shall be selected with the consent of the parties having the control of such streets and roads respectively, far facilitating the passage along the same streets and roads of carriages and traffic, by horse-power only:

And whereas such rails and plates, under proper regulations, would expedite the passage of traffic along the streets and roads on which the same are laid down, and would be a great public convenience:

And whereas it is expedient that provision be made with respect to the laying down and maintenance of such rails and plates, and that powers be granted for regulating the use thereof when laid down:

And whereas the aforesaid purposes cannot be effected without the authority of Parliament:

May it therefore please your Majesty,

That it may be enacted, and be it enacted, by the Queen's most excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:

I. This Act may be cited for any purpose as "The Street Rail Company (Limited) Act, 1861."

II. The clauses and provisions of "The Lands Clauses Consolidation Act, 1845," with respect to the purchase of lands by agreement shall be incorporated with and form part of this Act.

III. The following words and expressions in this Act shall have the meaning, hereby assigned to them, unless there be something in the subject or context repugnant to or inconsistent with such construction (that is to say):

The word "metropolis" shall mean the metropolis as defined in "The Metropolis Local Management Act, 1855;"

The word "parties," when used in connexion with the control, management, or repairs of streets, shall include the Metropolitan Board of Works, vestries, district boards, commissioners of the metropolis turnpike roads, the lord mayor, alderman, and commons of the City of London, trustees, grand juries, and all other bodies corporate, and persons;

The word "street" shall include any square, court, alley, highway, lane, turnpike or other public road, bridge, thoroughfare, or public passage or place, except a passage or footway for passengers only;

The word "rails" shall mean the iron rails and plates, whether temporary or permanent, which the company may lay down subject to the provisions contained in this Act, and the works connected therewith.

The words "city," "borough," or "town," shall respectively include all the suburbs and places immediately adjoining every such city, borough, or town.

IV. The company may from time to time lay down rails and maintain the same in, upon, and along the surface of such of the streets of the metropolis, and such of the streets of any other cities, boroughs, and towns in

the United Kingdom of Great Britain and Ireland, as shall be selected by and with the consent of the parties having respectively the control or management of any such street, or the duty of directing the repair thereof; and for that purpose may open and break up any such street, the company doing as little damage as may be, and making compensation for any damage which may be done in their operations.

V. The company on the one hand, and the parties for the time being having respectively the control or management or duty of directing the repairs of any street upon which rails are intended to be laid down by the company, on the other hand, may from time to time make and enter into agreements with respect to the laying down and maintenance of lines of rails in, upon, and along such street, and for the the working, using, maintaining and repairing thereof; and upon any such agreement being sealed with the seal of any body corporate party thereto, or signed by any person or persons not being a corporation party thereto, the same may be carried into effect accordingly, and be enforced by or against the company in any court of competent jurisdiction.

VI. After the company shall have obtained such consent as aforesaid, and before any street shall be opened or broken up by them, they shall give to the parties for the time being having the control or management or duty of directing the repairs of such street, or their clerk or surveyor, notice in writing of their intention to open or break up the same, *three* days at least before the commencement of such operation.

VII. Every such street shall be opened or broken up under the superintendence of the parties so having the control, or management, or duty of directing the repair of the same as aforesaid, or their officer, and according to such plan as to the situation, course, or direction of such rails as shall be submitted by the company to and shall be agreed upon between such parties or their officer, and the company or their servants.

VIII. When the pavement or soil of any street shall be opened or broken up by the company, they shall with all convenient speed complete the work on account of which the same shall be broken up, and fill in the ground and make good the pavement or soil so opened or broken up, and carry away the rubbish occasioned thereby, and shall in the meantime cause the place where such pavement or soil shall be so opened or broken up to be fenced and guarded, and set up and maintain upon or against the part of the said pavement or soil so broken up or opened, a sufficient light during every night such pavement or soil shall continue open or broken up.

IX. If the company shall fail to give such notice of their intention to break up any street as hereinbefore required, or shall break up any street without having given such notice, or shall make any delay in completing any such work, or in filling in the ground, or making good the pavement or surface so opened or broken up, or in carrying away the rubbish so occasioned as aforesaid, or in causing to be fenced, guarded, or lighted, the place where such pavement or surface shall have been broken up, they shall forfeit a sum not exceeding *five pounds* for every such offence, and a further sum not exceeding *five pounds* for each day during which such delay shall continue.

X. If any such delay as aforesaid shall take place, the parties having the control or management or duty of directing the repairs of the street in respect of which such delay shall take place, may cause the matter or thing so delayed to be done, and the expense of doing the same, together with the costs of recovering such expense, may be recovered from the company by action or otherwise.

XI. The company shall not remove or displace or interfere with any sewer or any of the mains, pipes, siphon plugs, tubes, or other works placed in or under any street without the consent of the parties having respectively the control and management of any such work or of their officer, and then only under the superintendence of such parties; and if the company shall offend against this provision, they shall for every such offence forfeit and pay a penalty of *five* pounds.

XII. The company shall make full compensation to all parties for any loss or damage which they may sustain by reason of any interference with any sewer, main, pipe, siphon plug, tube, or work as aforesaid, and such compensation shall be in addition to any penalty that may have been incurred by the company under the provisions of this Act.

XIII. The company shall, and they are hereby required, at their own expense, to do and perform all such acts and things in the way of watching, lighting, and fencing, and all such other precautionary measures during the progress of laying down their rails on any street under the provisions of this Act, as shall be necessary and requisite for the safety, convenience, and protection of the travellers on such street; and the company shall be answerable and amenable for all accidents and damage which may happen by reason or in consequence of their operations.

XIV. It shall not be lawful for the company to remove or interfere with the foot pavement of any street, nor shall their rails be laid along or across any portion of a street, which for the time being may be allotted and used as a cab-stand: Provided always, that the term "foot pavement" shall not include any pavement which may be laid across any street for the convenience of pedestrians crossing the same.

XV. Where, by reason of any repairs to any street upon which rails may have been laid down by the company, or to any pipes, drains, or sewers under such street, or of any repairs of the rails laid down thereon, or from any other cause whatever, the ground on which such rails are laid shall be excavated, the party removing such ground shall, whenever practicable, set up and maintain such props and braces as shall support the rails, and the carriages passing thereon; and whenever it shall be necessary to remove or close any part of the line of rails, it shall be lawful for the company to lay down, on some other part of the same or an adjoining street, temporary rails in the stead of the part so removed or closed, and to maintain and use such temporary rails until the part of the line of rails so removed or closed shall have been reinstated.

XVI. The rails shall be laid on the level of the surface of the streets, and shall be placed in such portion of the streets as the parties having the control or management or duty of directing the repairs of such streets may have directed, and shall be so constructed as not to obstruct the ordinary traffic of the streets, and so as not to endanger the safety of any person, animal, or carriage passing along or across the same; and it shall not be lawful for the company, or for any other persons using the rails, to employ thereon locomotive engines, or any other than animal power.

XVII. No person authorized by law shall break open any soil or pavement of the portion of any street along or across which the rails may be laid as aforesaid, or remove, or close, or obstruct, any part of the rails for the purpose of repairing any such soil or pavement, or making, or laying down, or removing any sewer, drain, or pipe, under such road or pavement, or for any other purpose whatsoever, except in case of sudden and urgent necessity, without having previously left *three* clear days notice in writing at the local office for the time being of the company, stating in such notice the name of the street, and the particular part thereof, in which the rails intended to be removed, closed, or obstructed, are situated, the day on which the work is proposed to be commenced, and the time within which it is to be completed; and in case a removal of any part or parts of the line of rails shall be necessary, the company shall remove the same accordingly, or otherwise provide for the opening of the said street; and if they shall neglect do do so before the expiration of any such notice as last aforesaid, it shall be lawful for the person leaving any such notice as last aforesaid to remove so much of the rails in such notice mentioned: Provided always, that, whenever any such person authorized by law as aforesaid shall, in the execution of the powers vested in him, remove, or close, or obstruct, any part of the line of rails, he shall do so with as little damage to the part removed, closed, or obstructed, as can be; and shall, with all convenient speed, reinstate the same at his own expense, upon the same plan, and in the same condition (as nearly as may be) as it was before such removal.

XVIII. All parties using the streets may run over and upon the rails and plates so laid down with common road-wheels; but the company shall have the exclusive right of working and using carriages with flange-wheels adapted to run on edge rails, and it shall not be lawful for any other parties to place or use upon the rails of the company any carriages with flange-wheels, or wheels specially adapted to run on edge rails, other than those provided by the company.

XIX. The company shall at their own expense maintain and cause to be repaired from time to time such portions of any street, whereon their rails may be laid down, as lie between the lines of rails, and as extend *ten* inches beyond and outside of such lines of rails; and the company shall be exempt from the payment of any rate for paving or repairing the street upon which the rails shall be laid.

XX. Nothing in this Act shall exempt the company or any other persons using the rails when laid down, or any carriages for the conveyance of passengers for the time being used upon the said rails, or the drivers or conductors thereof, from any of the laws for the time being in force with regard to the regulation of metropolitan stage carriages, and the drivers and conductors thereof, or from the laws for regulating any similar carriages for the conveyance of passengers for the time being in force in any town or place in the United Kingdom of Great Britain and Ireland, on any part of the streets of which such rails may be laid as aforesaid.

XXI. Nothing in this Act contained shall extend to charge or make liable the company further, or in any other case, than where according to the laws of the realm stage-coach proprietors would be liable, nor shall extend in any degree to deprive the company of any protection or privilege which stage-coach proprietors may be entitled to; but, on the contrary, the company shall at all times be entitled to the benefit of every such protection and privilege.

XXII. It shall be lawful for the Commissioners of Police of the metropolis as respects their district, and for the Lord Mayor of the City of London as respects the said city and the liberties thereof, and for the police authorities of any other town in the United Kingdom as respects the districts over which they have respectively jurisdiction, when the company shall have laid down rails upon the streets within such districts, to make and enforce such regulations from time to time as they may respectively think fit with respect to the passage of all traffic along such streets, whether upon or off the said rails.

XXIII. All penalties and forfeitures for the recovery of which provision is not otherwise made by this Act, may be recovered and enforced in like manner as is provided for the recovery of penalties by "The Railway Clauses Consolidation Act, 1845," and for such purposes the clauses and provisions of that Act, with respect to the recovery of damages and of penalties, and to the determination of any other matter referred to justices, shall be held to be incorporated with this Act.

XXIV. The provisions of this Act shall, so far as they are severally applicable, extend and apply to any rails which the company have laid down prior to the passing of this Act: provided always, that nothing herein contained shall be deemed or construed to give any validity to or render invalid any agreement or arrangement which may have been made with respect to such rails.

XXV. Except as is herein expressly provided, nothing in this Act contained shall extend to authorize any interference with the powers given by law to the Commissioners of Police of the metropolis, or the Commissioners of the City Police, or the police of any other city, borough, or town in the United Kingdom, or with the powers vested in any vestries or district boards, or the Metropolitan Board of Works, under an Act passed in the nineteenth year of the reign of Her present Majesty, intituled "An Act for the better Local Management of the Metropolis;" or in the City Commissioners of Sewers, or in the parties having the control or management of the sewerage or drainage of any other city, borough, town, or place, or with the powers of the commissioners or trustees of any street or road.

XXVI. Nothing in this Act shall extend to affect any of the rights, privileges, powers, or authorities vested in any gas, water, or telegraph company whose mains, pipes, wires, or other apparatus may be laid under the surface of any street along which the rails of the company shall be carried.

XXVII. Provided always, that this Act shall not be held to incorporate the company further or otherwise than it may be already incorporated, or to relieve the company, or any of the shareholders thereof, from any contract, duty, obligation, or responsibility whatsoever, to which by law they respectively, or any of them, either as between the company and other parties, or as between the company and any of the individual shareholders thereof, and others, or as between themselves, or in any other manner are already, or may at any time after the passing of this Act, be liable.

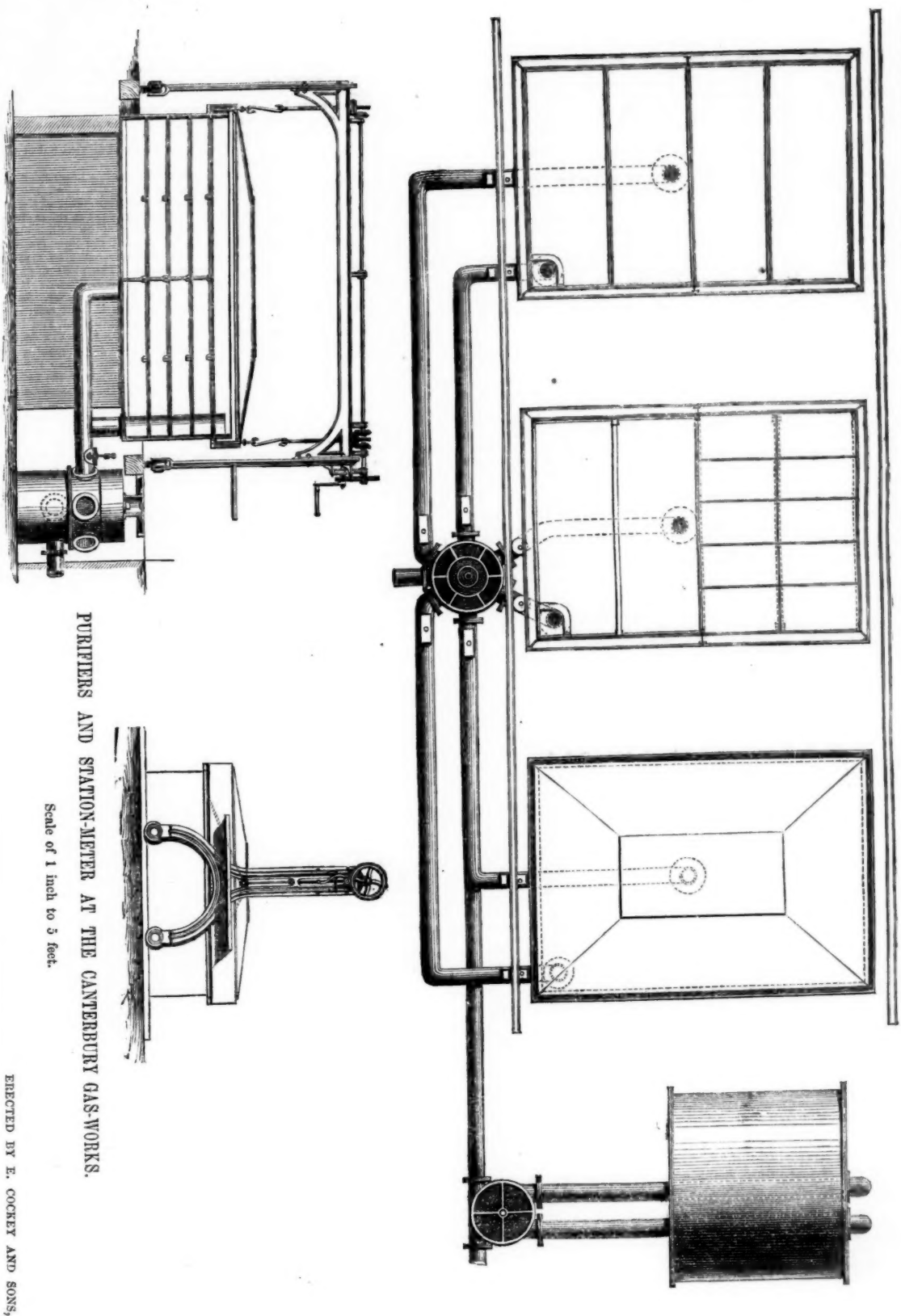
XXVIII. Subject to the provisions of this Act, the several provisions of the memorandum of association and articles of association of the company shall extend and apply to the several purposes of this Act as fully and effectually as if the several purposes of this Act had originally been provided for by the same respectively, and the powers of the company, and the shareholders thereof, and the general meetings of the company, and the directors of the company respectively, shall extend according to the several purposes of this Act.

XXIX. This Act, and all the provisions thereof, shall extend to the company at all times during the continuance thereof, and whether or not the company be from time to time composed wholly or in part of the original shareholders, or wholly or in part of new shareholders.

XXX. Except as is by this Act otherwise provided, the company shall possess the same powers, rights, and privileges, and be governed by and subject to the same rules, regulations, and obligations as if this Act were not passed.

XXXI. This Act shall not exempt the company from the provisions of any general Act already passed, or hereafter to be passed, relating to joint-stock companies with limited liability.

XXXII. The costs, charges, and expenses of and incident to the obtaining and passing of this Act shall be paid by the company.



PURIFIERS AND STATION-METER AT THE CANTERBURY GAS-WORKS.

Scale of 1 inch to 5 feet.

ERECTED BY E. COCKEY AND SONS, FROME.

Legal Intelligence.

COURT OF QUEENS' BENCH.

MONDAY, Nov. 26, 1860.

(*Sittings in Banco, before Lord Chief Justice* COCKBURN *and the other Judges.*)

REGINA, ON THE PROSECUTION OF THE PARISH OF RUSHTON SPENCER, *v.* THE NORTH STAFFORDSHIRE RAILWAY COMPANY.

Mr. SCOTLAND appeared for the railway company (appellants), and Mr. LUSH and Mr. M'MAHON for the parish (respondents).

Upon appeals by the North Staffordshire Railway Company against two rates made for the relief of the poor of the township of Rushton Spencer, in the county of Stafford, the following case was, by consent and by order of Justice Hill, stated for the opinion of this court, under 12 and 13 Vict. c. 45:—

The North Staffordshire Railway passes through the township of Rushton Spencer, for a distance of 104 chains, and in respect of this portion of their line of railway, and the stations, buildings, and sidings within the said township, the appellants are assessed in each of the said rates upon a net rateable value of £219. The appellants and respondents are agreed to take as the gross earnings in the said township of Rushton Spencer for one year the sum of £1761. The total working expenses of the line for one year ending the 30th of June, 1858, including rates, taxes, and Government duty, and certain tolls payable to the Midland Railway Company, amounted to £132,290, of which sum it has also been agreed that £965 is the fair portion chargeable to the said township of Rushton Spencer, and to be deducted from the said gross earnings in ascertaining the net rateable value of the said line in the said township. The appellants and respondents differ as to certain other items of deduction, hereinafter mentioned. The rolling-stock of the company, which includes the locomotive engines, tenders, passenger carriages, horse-boxes, carriage-trucks, luggage-vans, goods, cattle, and mineral waggons, and all other of every kind for the conveyance of persons, cattle, animals, goods, wares, minerals, merchandize, or other articles, matters, or things whatsoever, on the railway, cost the sum of £356,843; and for the purposes of this case it is admitted that this was a fair price at the time the articles constituting the railway stock were purchased, and also that similar articles would at the time of levying the rate have cost as much. In addition to this stock, the company have been obliged to provide, at a cost of £52,950, turn-tables, cranes, weighing-machines, stationary steam-engines, lathes, electric telegraph and apparatus, office and station furniture, and gas-works. The turn-tables and some of the weighing-machines are affixed to the freehold by means of an iron band inserted in a large stone sunk in the land. The lathes and steam-engines are connected with the buildings in which they are placed by means of iron bolts. The electric telegraph consists, first, of posts driven into the ground; second, of wires passed through the sockets of such posts, but which wires may be disconnected from the posts without injury or displacing them; thirdly, of the electrifying machines, which are in no way affixed to the freehold. The gas-works consist partly of buildings and partly of gasometers, and the other usual plant for making gas, and of the pipes for conveying the same from the works to the railway stations; the other weighing-machines, which are all used for the purposes of the traffic on the line, and the office and station furniture, are unconnected with the freehold. The company allege, and for the purposes of this case it may be admitted to be the fact, that it has been found necessary, in carrying on the traffic and business of the railway, that the company should have in hand at command a sum of money by way of floating capital, for the purpose of providing surplus stores, such as rails, sleepers, &c., to be used in case of accidents on the line or other emergency, and partly in paying the wages of porters, pointsmen, and other servants of the company, and in the current expenses of the line, which are for the most part paid weekly, or at other short periods. The traffic over the whole of the company's line of railway is worked under a contract, which contract it has been agreed upon shall form part of this case. The total amount of deductions made by the company from the contractors at the time when the rates were made in respect of the depreciation of the rolling stock and plant in the hands of the contractors was £71,000, which sum would not be more than sufficient to restore the said rolling stock and plant to its original value, but which sum it is admitted has not been expended in such restoration. The company have also expended in the erection of their stations, buildings, and sidings, the sum of £360,000. The respondents contended that the deduction to be allowed in respect of interest on capital and tenants profits ought to be ascertained by taking as the capital sum upon which such interest and profits ought to be calculated, the actual or depreciated value of the rolling stock at the time the rates were made, and that no allowance for interest and tenants profits should be made in respect of a floating capital. The respondents also contend that the deduction to be allowed in respect of the turn-tables, cranes, weighing-machines, stationary steam-engines, lathes, electric telegraph apparatus, gas-works, stations, buildings, and sidings, ought to be ascertained by taking the amount at which they are collectively assessed to the relief of the poor in the several parishes and townships within which the several parishes and townships are severally situated, and dividing the said amount between each parish and township in a certain proportion agreed upon between the said respondents and appellants. The appellants contend that they are entitled to claim, as the proper deduction in respect of interest on capital and tenants profits, the per centage amount calculated upon the whole amount of the said capital sums of £356,843, £52,950, and the floating capital. They also contend that the proper deduction to be allowed in respect of all the stations, buildings, and sidings, is 6 per cent. per annum (which is a moderate rate of interest for money invested in buildings) upon the original cost of construction, and to take the annual amount so ascertained as the value to be deducted. It is agreed that, with reference to this head of deduction, the original cost of construction of the whole of such stations, buildings, and sidings, was £360,000. The questions for the opinion of the court are: First, whether the per centage amount to be allowed for interest on capital and tenants profits is to be calculated on the capital invested in the rolling stock taken at its cost prices, or upon the depreciated value of the rolling stock as estimated at the time when the rates were made, or at any other time. Secondly, whether the appellants are entitled to a deduction for interest on capital and tenants profits upon the said sum of £52,950, the additional amount of capital invested in turn-tables, cranes, weighing-machines, stationary steam-engines, lathes, electric telegraph and apparatus, office and station furniture, and gas-works, or upon any and what portion of such items; and if so, upon the sum originally invested in the said plant, or upon the depreciated value of the same, estimated at the time the rates were made, or at any other time; or how otherwise a deduction, if any, should be made in respect of the last-mentioned plant, or in respect of any part thereof. Thirdly, whether the appellants are entitled to a further deduction for interest and tenants profits, or either, upon the floating capital required to be kept in hand for the purchase of stores, such as rails, sleepers, &c., and for the payment of wages, and the current expenses of working the line. Fourthly, whether the deduction to be allowed in respect of the stations, buildings, and sidings along the line of railway ought to be ascertained by taking the rateable value at which the same are assessed to the relief of the poor only, allowing 6 per cent. upon the original cost of construction, as contended for by the appellants, or how otherwise a deduction should be made in respect of the said stations, buildings, and sidings. It is agreed that, upon the decision of the court being given on the said several questions, the proper amount of assessment to the said rates shall (if necessary) be ascertained and settled in conformity with such decision by agreement between the parties, or by an accountant to be appointed by the attorneys on both sides, and the rate amended accordingly. And it is further agreed that judgment confirming or (if necessary) amending the said rates in conformity with such decision, and for such costs as the court shall direct, shall be entered on motion by either party at the sessions for the said county next or next but one after such decision shall have been given.

At the conclusion of the arguments, the court took time to consider.

Lord Chief Justice COCKBURN, in delivering the judgment of the court, said: Four questions are propounded in the case for the decision of the court. The first is, whether the per centage amount to be allowed on the capital and tenants profits is to be calculated upon the cost price of the rolling stock, or on the depreciated value which that stock may bear at the time the rate is actually made. We are of opinion that the allowance must be made with reference to the actual, and not the original value. The point has already been decided by this court in *Regina, v. The Great Western Railway Company*, 6 Q. B., 179, in which decision we entirely concur. In addition to the reasons given in the judgment of the court in that case, it may be observed that that is under the Parochial Assessment Act, and tenants profits on stock must necessarily be calculated with a view to a deduction from the gross earnings, in order to ascertain what a tenant would give for the entire property. Nothing could be more inconvenient than that a different principle should prevail in calculating the profits in the two cases. Now the question, when considered under the Parochial Assessment Act, must be looked at, not with reference to railway companies who may have expended in the purchase of stock a much larger sum than the stock would now realize, but with reference to an in-coming tenant, and the amount of capital such tenant would have to lay out in the purchase of the rolling stock necessary to carry on the undertaking. It is obvious that what it would be worth the while of a person or company about to embark in a commercial undertaking to give as the rent for the premises in which such undertaking is to be carried on, would depend on the amount to be deducted in addition to repairs and other necessary outgoings from the gross earnings in respect of the profits, and to the capital invested in the concern. But it is plain that a tenant would calculate such profits on the amount of the capital actually required to be invested in the stock, and not upon what may have been the value of the stock at some other time, and to some other person. Now, it must be assumed that the stock, in its existing condition, is sufficiently effective to produce the earnings which, after the necessary deductions, constitute the improved value of the railway; and it cannot reasonably be supposed, if the company were about to give up the undertaking, they would not be content to part with the stock at its actual value; or, if they were to do so, the in-coming tenant could not procure other stock, of an equal efficient character and value, to supply the deficiency. It follows that, in estimating under the statute 6 and 7 Will. 4, c. 96, what a tenant would pay for, the profits must be calculated on the actual value of the stock. It cannot be supposed that, in exempting profits under the 6 Vict., a different principle of calculation was intended to be acted upon. The second question is, whether the company are entitled to a deduction in respect of the capital invested in the various articles therein specified, being things necessary for carrying on the business of the company. The articles to which such a question may have reference may be divided into three classes—first, things moveable, such as office and station furniture; secondly, things so attached to the freehold as to become part of it; and, thirdly, things which, though capable of being removed, are yet so far attached as that it is intended they shall remain permanently connected with the railway, or the purposes connected with it, as certain permanent appendages to it, and essential to its working. It is clear, in respect of the first class of articles, a deduction should be allowed: it is equally clear that no deduction should be allowed as to the second; as to the third, the question is finally settled by the decision of the court in the case of *Reg. v. Southampton Docks*, 14 Q. B., 587. The third question, whether the company are entitled to a deduction in respect of the floating capital therein referred to, is one of considerable nicety, and which, as it appears to us, must depend upon whether, on the whole capital employed, a greater delay occurs in realizing the return than is ordinarily incidental to the employment of capital? No doubt the rent which an imaginary tenant contemplated by the Parochial Assessment Act could afford to pay would be the difference between the gross earnings after the necessary deductions and the amount of profits, due reference being had to the nature of the undertaking and the capital invested. Whatever tends to diminish such profits, must go *pro tanto* to diminish the rent. Any delay in realizing the profits beyond such as is necessarily incidental to the ordinary employment of capital, may, and it must be presumed they would be, taken fairly into account by the tenant in determining the rateable value. On the other hand, it must be observed that a large proportion of the earnings of a railway company is of a ready-money character. It may well be that when the whole of the capital and the whole of the earnings are taken into account, the profits on the whole capital realized in the shares come, in this species of undertaking, under the average of commercial enterprize. If this should be a cause of delay in realizing the profit that may arise as the amount of the capital, this may be considered to be compensated by the more than ordinary quickness of the return. On the whole, we have no means before us of determining the question with reference to this view of the case. All we can do is to point out the principle by which we think it must be determined. As regards the fourth question, we are of opinion that the deduction to be allowed in respect of stations, buildings, and sidings, must be calculated on the actual value at which they ought to be assessed, and not on the original cost of their construction.

TUESDAY, JAN. 15.

(*Sittings in Banco, before Lord Chief Justice* COCKBURN *and Justices* CROMPTON, HILL, *and* BLACKBURN.)

BLENKIRON *v.* THE GREAT CENTRAL GAS COMPANY.

Mr. HAWKINS, Q.C., said this was a case which was tried before the Lord Chief Justice, at Guildhall, on the 14th and 15th of December last, and resulted in a verdict for the defendants. He had now to move the court to set aside that verdict, and for a new trial, upon the grounds of misdirection, the verdict being against evidence, and also upon affidavits. The

declaration alleged that the plaintiffs were possessed of premises in which they carried on the trade and business of warehousemen in the City of London, and that they were possessed of certain goods therein; that the defendants were engaged and employed in laying on and supplying gas to a certain messuage and premises contiguous to and adjoining the said premises of the plaintiffs; and that, by their servants in that behalf, they so negligently, carelessly, and improperly conducted themselves in and about the laying on of the said gas, and that they took such little, or such bad and insufficient care and precaution, to prevent the said gas from escaping and becoming ignited, that, by reason of such negligence, divers quantities of the said gas did escape and become ignited, and set fire to the messuage and premises belonging to the plaintiffs. The second count was to the same effect—viz., that the defendants negligently and wrongfully exploded and set on fire a large quantity of gas near the plaintiffs premises, whereby the said premises were set on fire. The defendants pleaded "Not guilty," and also denied the fact that their servants were engaged in laying on gas to the premises contiguous to those of the plaintiffs. On these pleas, issue was joined.

Justice BLACKBURN: The supply of gas was not to the plaintiffs premises?

Mr. HAWKINS: No, my lord, to the premises adjoining.

Justice BLACKBURN: Premises in the occupation of a third person?

Mr. HAWKINS replied in the affirmative. The facts of the case were these:—The plaintiffs had a warehouse at No. 123, Wood Street, adjoining those of a Mr. John Lee Morley, also a warehouseman, and who, prior to the 27th of February, 1860, was supplied with gas by the Chartered Gas Company. Shortly before that time, a servant of the defendants—a Mr. Cheeseman—applied to Mr. Morley to substitute for the gas of the Chartered Company that of the Great Central Company in the lighting of his premises, and Mr. Morley had given his assent to that application. On the morning of the 27th of February, two workmen in the employ of the defendants went down to Mr. Morley's for the purpose of effecting the alteration in the supply of gas.

Lord Chief Justice COCKBURN: What is the misdirection you complain of?

Mr. HAWKINS: That your lordship left it to the jury to say whether or not due and proper precaution had been taken to prevent an escape of gas. In an ordinary case of accident arising from negligence, I should not have had reason to complain of that as a misdirection; but I say that, where you are dealing with a dangerous fluid like gas, it is not the taking of mere ordinary precaution which is sufficient to exempt the defendants from liability in case of accident and injury arising, but the question is whether all means were used within their power.

Lord Chief Justice COCKBURN: It is rather strong to speak of misdirection in this case. I refused to take the verdict of the jury because they said the defendants took ordinary care, and I pointed out to them the very distinction which you are now pointing out, and sent them back to reconsider their verdict. Because they found in the way you say I left it to them, I would not take their verdict.

Mr. HAWKINS: I will read what did take place. I think your lordship did say that ordinary precaution was insufficient.

Lord Chief Justice COCKBURN: Here is my note. I generally make my note before I charge them. "I leave to the jury, first, whether it was the defendants gas which exploded?"—that being one of the questions, whether or not the gas was the gas of the defendants—"and if so, secondly, was there negligence in the defendants servants, either in omitting to take such measures which, in the exercise of reasonable skill and care, they ought to have taken to prevent an escape of gas, or in opening the main under the surrounding circumstances?" The jury came back, and found that defendants had used ordinary care. I declined to receive that verdict, and pointed out to them that what they must determine was, whether the defendants did all that could reasonably be expected of them? I told them that the general practice in such cases would be no answer to a claim for damage arising, if that practice was careless or negligent; but, at the same time, I told them that the generally established practice of other companies was cogent evidence in favour of the presumption that what they did was reasonable and proper. I remember, in summing up, more than once adverting to the dangerous character of gas; and I am quite sure that I pointed out to them that the question of whether the company had used reasonable care in doing what they did, must be taken with reference to the subject matter in hand.

Mr. HAWKINS: It is with reference to that my observations applied.

Lord Chief Justice COCKBURN: You say I ought to have pointed out to them that, gas being a dangerous element, they were bound to do everything which modern knowledge and skill could suggest to prevent that gas from escaping and working mischief—that is exactly what I did.

Mr. HAWKINS: Using reasonable care would be insufficient.

Justice CROMPTON: Surely that is right; it must be reasonable care.

Lord Chief Justice COCKBURN: I summed up in your favour.

Justice BLACKBURN: It is quite sure that reasonable care to keep in a sheep is one thing, and a lion another; but, whether the case is that of a sheep or a lion, it would be reasonable care that is required.

Mr. HAWKINS: I propose to put it in one word, in this way—that there being something which at the trial it appeared the company might have done, assuming the gas which escaped was theirs, they were bound to do it.

Lord Chief Justice COCKBURN: What was that?

Mr. HAWKINS: The closing of the windows.

Lord Chief Justice COCKBURN: I pointed that out to the jury: I summed up in your favour, but they would not have it; they deliberated very carefully, and they said it was one of those unaccountable accidents for which the company were not to blame.

Justice CROMPTON: You say the Lord Chief Justice should have left it to the jury to say whether the company had used due and reasonable care to prevent an escape of gas. What do you mean?—that they must take more than ordinary care?

Mr. HAWKINS: "Ordinary," in one sense, would not do.

Lord Chief Justice COCKBURN: I thought I went to the extreme in summing up for you; therefore, I cannot help thinking you are rather ungrateful.

Mr. HAWKINS: I thought your lordship might have gone further, and said that, if anything at all was left undone by them——

Justice CROMPTON: Which they ought to have done; not to make them insurers.

Mr. HAWKINS said he would pass on from the question of misdirection, and refer to the facts of the case. On the morning of the 27th of February, 1860, two men—Bicknell and Allen—in the employ of the defendants, went down to Mr. Morley's premises, which consisted of a large warehouse adjoining the plaintiffs, having an extensive room in the basement, The model now produced correctly described the premises of Mr. Morley.

Lord Chief Justice COCKBURN: This was not used at the trial.

Mr. HAWKINS: No.

Lord Chief Justice COCKBURN: I think it is a great pity it was not. I felt the want of one all through the case.

Mr. HAWKINS said he also regretted it, and had entreated and implored that one might be laid before them. [The learned counsel explained the various parts of the premises by means of the model, and pointed out the relative positions of the defendants main and the trench dug for the service-pipe in relation to the same.] The only question for consideration was, how Mr. Morley's premises were set on fire. At the time the defendants workmen went, there were three or four gas-burners alight in the basement, and they intimated to Mr. Morley's servants that they were about to lay on a service-pipe, and asked whether the lights could not be put out. The men said they could not do without them; upon which Bicknell and Allen went away, and subsequently proceeded to dig a trench in the pavement from the Central main, which was about 2 feet 6 inches from the wall of the premises, before they commenced tapping the main. Now, there was no doubt at all that, shortly after the hole for the service-pipe had been made—according to the evidence of some of the witnesses, within about six minutes—a very violent explosion took place, and a considerable amount of injury was done. The result was that, in about one hour, the premises of Mr. Morley, Mr. Blenkiron, and premises belonging to other persons, were entirely consumed, and other damage done, to the extent of £50,000. On the part of the plaintiffs, the case was this: first of all, at the outset of the inquiry, he certainly made complaint that, in tapping the main for the purpose of laying on the service-pipe, the defendants servants omitted to bladder it.

Lord Chief Justice COCKBURN: There was an overwhelming amount of evidence to show that this was not a case in which that was applicable. It is not worth while to go into that; you were thoroughly beaten upon it, and it only complicates the matter.

Mr. HAWKINS said he would pass it over. It appeared from the evidence that, at the time the main was tapped, there were some open doors or windows below a grating, within a short distance of the trench, which windows communicated directly with the basement of the premises where the lights were burning. It was alleged, on the part of the plaintiffs, that the gas that escaped from the defendants main-pipe found its way either through a hole which their men made through the wall into the basement for the purpose of admitting the service, or through these open gratings, whence it descended into the open windows, and so the explosion took place. And they alleged that it was very negligent on the part of the defendants servants that they allowed the escape of gas to occur, with the full knowledge there were lights actually burning in the basement at the time.

Lord Chief Justice COCKBURN: There can be no doubt that if the hole, through which the pipe had been introduced into the wall of Mr. Morley's premises had been left open, so that the gas could pass through and fill the room below, where the burners were, that would be not only negligence, but gross negligence. But then these people were called, who swore most distinctly that they had carefully stopped up this hole, so that no gas could pass through it; and, upon that part of the case, the jury found there was no negligence.

Mr. HAWKINS admitted there was no evidence to answer that part of the case, that the men had filled up the hole with tow; so that in the result, it came to this: it was within the knowledge of the persons who laid on the gas, that there was an open grating, with open doors communicating directly with the basement, in which, at the time they were so engaged, there were lights burning, and this might have led to the explosion.

Lord Chief Justice COCKBURN made some inquiries respecting the model, and intimated that he thought the two open doors beneath the grating leading into the basement of the premises would not be visible to the men in the street, sitting on the pavement and working there.

Mr. HAWKINS said he was told that they would be, and at the trial it was admitted on all hands that these doors, which were then called windows, were open at the time. It was not disputed at the trial that they knew perfectly of the existence of those two windows.

Lord Chief Justice COCKBURN: That is to say, in this sense, they went down into the basement in the morning, and wanted the lights put out, and they could not have the lights put out; therefore, it might be assumed that they knew something about it. There was a good deal of conflict of opinion on the part of scientific people whether the gas would be likely, or whether it would be apparent to anybody that the gas would find its way downward. It was considered that gas was a light fluid: so that it would go up instead of down. Therefore, the question whether it would have presented itself to the mind of these men, or any person employed to do a job of this kind, that through such a grating as that, the gas could get down, and, having got down, could find its way through the windows that were open, was a fair question for the jury.

Mr. HAWKINS: Throughout the whole of the plaintiffs case, there was not a single question put to a single witness called on the part of the plaintiffs, as to whether or not the gas could have escaped in that manner, and so found its way into the basement: it was not intimated, during the whole of the plaintiffs case, that that was to be the line of defence on the part of the defendants.

Lord Chief Justice COCKBURN: But, on the other hand, I think the plaintiffs case was originally shaped in this way. Your great ground of complaint was that they had not used the bladdering process—that was the first point; and then the second was, that that hole must have been left open and the gas have got in through the hole. I think this question about the grating and the open window below was rather brought into prominence when you were beaten upon this point. Your witnesses did not come to prove anything further than this. Your case, as first presented, was certainly that that hole had been left open, and that the gas immediately would have found its way through that hole. From the trench there would be communication with the hole through the wall; the gas escaping through the trench would go in immediately and fill the space below, and then they said—"Ah, we stopped up that place, and therefore that is impossible." Then you said, "It must have got in through the windows."

Mr. HAWKINS: We certainly put the case, first of all, that they did not take proper care in not bladdering the main; but I pass that over because your lordship says I ought not to mention it here, and because, no doubt, there was a great body of evidence with respect to that, and I had no evidence in contradiction of it. But then what I stated was this, even although you were right in the course you pursued in not bladdering the main, still you enabled your gas to escape from the main into the house, and we suggested that no doubt it did go through that hole, there being no evidence within the power of the plaintiffs for the purpose of showing how the gas had actually come in, and there being the hole in the premises. But I do not think your lordship will say that we omitted to mention the fact.

Lord Chief Justice COCKBURN: No; I only say that that accounts for their not cross-examining your witnesses upon that point.

Mr. HAWKINS: But your lordship will remember that it was long before they came to the only witness whom they could cross-examine on the scientific question—a gentleman named Upward.

Lord Chief Justice COCKBURN: You might have called the witness back as to that.

Mr. HAWKINS: It will be a part of my case on the affidavits that we were taken entirely by surprise at that part of the case, because I have a body of evidence with respect to what ought to have been done with reference to those windows.

Justice HILL: New witnesses, or the old witnesses?

Mr. HAWKINS: New witnesses, my lord, because we were certainly taken entirely by surprise at hearing these gentlemen state that it was not a matter which they themselves, using ordinary precaution, would have done, to have closed those windows in the basement, through which, beyond all doubt, I think I am justified in stating, although the jury said they could not agree upon the fact, the gas did come. Because your lordship will remember, on the part of the defendants, it was alleged first of all that it was not gas at all from the Central Company's main, but that it was gas which had escaped from a burner left open.

Lord Chief Justice COCKBURN: I thought they were thoroughly beaten upon that.

Mr. HAWKINS: Thoroughly; but your lordship will remember what the jury said that, although they came to a conclusion upon the most difficult question, yet upon the other question, as to whose gas it was, they were equally divided in opinion.

Lord Chief Justice COCKBURN: They did not say they were equally divided in opinion, but that they were divided; but that was unnecessary, as they were all agreed upon the other point.

Mr. HAWKINS: I think I am fully justified in stating that, upon that part of the case, there was really no evidence at all to show that the gas which escaped and caused the explosion was gas that escaped from the open burner; for there was not any question at all about it, and I have evidence to show that it would not be possible.

Lord Chief Justice COCKBURN: They were beaten upon that.

Mr. HAWKINS: Very well, my lord. No witnesses were called back, as your lordship will remember, for the purpose of contradicting the testimony of those gas engineers that were called; indeed, there were only four gentlemen who gave evidence upon the subject, on the part of the defendants, as to ordinary care having been used. There was Mr. Jones, Mr. Tully, Mr. Hersey, and Mr. Spice.

Justice HILL: I do not understand you, Mr. Hawkins. What surprises me in your case is this; you put your case upon two strong grounds at first, upon both of which you are beaten upon matters of fact proved out of court. Then you say there is a third ground upon which I put my case, and there is contradictory evidence, and they beat you upon that. Are you taken by surprise? it cannot be true.

Mr. HAWKINS: No, my lord; it is not contradictory evidence.

Justice HILL: It cannot be true.

Mr. HAWKINS: There is no contradictory evidence, as your lordship will see when I come to call your attention to what the witnesses really did say on this part of the case. Your lordship will find that it is not contradictory evidence, and that it could not be expected we should be prepared with evidence upon the subject at all upon the trial.

Justice BLACKBURN: Let me see if I understand rightly what took place at the trial. Pass by the bladdering. You start with your case in this way: the gas passed through a hole which it would have been negligence to leave open.

Mr. HAWKINS: Yes.

Justice BLACKBURN: They prove strongly that they stopped up that hole with tow, so that the gas could not come in. Then, if the hole was stopped up, as the gas had got in somehow, it follows that it must have gone up and been sent down that grating, and through the open window into the interior of the premises.

Lord Chief Justice COCKBURN: That it descended.

Justice BLACKBURN: I know; was sucked in downwards. They say, true it is, it was sucked downwards in that way; but it is no negligence in the two workmen that were employed not to anticipate that. You say you were taken by surprise; but how came you to be surprised when it was the essence of your case to show how the gas came in? How can you be surprised at the gas being said to be sucked down in that way, if the matter was so patent and obvious? If the two workmen ought to have seen it, and it was negligence in them not to have seen it, how was it not negligence in your attorney and your scientific people not to have anticipated it?

Mr. HAWKINS: We say this, that, looking at the position of the hole, looking at the state of the basement at the time that the burners were actually burning in there, looking at the state of the basement, in which I should have said to your lordship there was a staircase which formed a sort of shaft, we say that any person of ordinary common understanding of the subject must have known perfectly well that he was dealing with a dangerous fluid; and this gas having escaped here, and being emitted in a quantity of—I think, about 70 cubic feet a minute (because that is the evidence I am prepared to offer to the court now—70 cubic feet per minute) being emitted from the hole which they had actually made in the main, and being emitted for a period of some six minutes, there would be about 400 cubic feet.

Lord Chief Justice COCKBURN: While they were putting in the pipe?

Mr. HAWKINS: Yes. I quite agree with your lordship that there must be an escape; but there was an escape of a very large quantity in the immediate vicinity of these windows.

Lord Chief Justice COCKBURN: There must be an escape of a very large quantity; take that.

Mr. HAWKINS: And those who permitted this large escape were perfectly aware of the fact that it was escaping within a foot of this open grating, which immediately communicated with the basement in which the lights were burning at the time, and in which also there was a staircase operating as a flue or shaft. We say that any person of ordinary understanding, having any knowledge whatever of the properties of gas, must have known perfectly well that, under the circumstances, the gas would of necessity be sucked down into the basement, and all the scientific evidence in the world which went to show that that could not have happened, would have been, or ought to have been, treated by the jury as being utterly absurd and ridiculous. Your lordships will find, when we come to look at the affidavits on that part of the case——

Lord Chief Justice COCKBURN: We must look at what the evidence was before the jury in the first place, to see whether the verdict is against the evidence. What you may do on the matter of surprise is another thing; but, when we are considering whether a verdict is against the evidence, we must look at what evidence we had.

Mr. HAWKINS: In dealing with the evidence, we must look at what one knows is a matter of ordinary common knowledge, and it certainly could not fail to take anybody by surprise, to hear three or four gentlemen come forward with the judgment they had actually formed of the matter, with a knowledge of the fact that there was this hot air created by the gas-burners in the basement, which was in immediate communication with these open windows.

Justice HILL: The case did not turn upon that, Mr. Hawkins; the jury did not give their verdict upon the point whether it was the defendants gas or not; they gave their verdict on the other ground.

Lord Chief Justice COCKBURN: They say it was not necessary to decide the first question, because, they say, assuming this was an accident caused by the defendants gas, there was no negligence.

Mr. HAWKINS: Yes, my lord; and that is what I complain of, because assuming it was the defendants gas, what we say is this: if you choose to send persons who are unacquainted with the properties of gas for the purpose of performing an operation of this sort, you must be responsible. If you had sent persons acquainted with the properties of gas, as you ought to have done, this accident would not have occurred.

Lord Chief Justice COCKBURN: Must it be a man of science?

Mr. HAWKINS: No, my lord; it does not require a man to be very deeply versed in science.

Lord Chief Justice COCKBURN: On the other hand, there were four gentlemen who were very familiar with the properties of gas, who said they did not believe the gas would descend.

Justice BLACKBURN: If there was a sufficient downward draught to suck the gas in, I could suppose you might have a case upon that; but what evidence was there that these two men must have known, unless they were negligent, that there was this downward draught?

Mr. HAWKINS: Because they were actually in the basement; they had been in the basement several times during the course of the morning, and they were aware of the fact of the gas burning there, and they were aware of the fact of this staircase or shaft leading into it.

Justice BLACKBURN: Does it necessarily follow that they would be aware which way the draught would go? I think it would be a matter requiring some thought.

Mr. HAWKINS: At all events, they ought to have thought upon the subject, and have considered the matter; and, when there was anything so obviously easy, by which they might have avoided the difficulty—viz., the mere closing of those windows which they knew were open, surely there must be some negligence on their parts in not causing them to be closed. If they had been closed, it would have been utterly impossible for the gas to escape into the premises.

Lord Chief Justice COCKBURN: I do not say, Mr. Hawkins, what my own conclusion would have been if it had been left to me; I said all I could in your favour, but I really think it was a question for the jury whether, under all the circumstances, there was what could fairly be called negligence, so as to make the defendants responsible. That the gas made its escape, got down the grating, was drawn into the window, and filled that room in the course of a very few minutes, or perhaps seconds, when the explosion took place—I think, looking at all the circumstances, one can entertain very little doubt. Whether or not, after the event, scientific men, looking at the matter with reference to the properties of the gaseous fluid, came to that conclusion, is one thing; the question is whether, looking to the class of persons who must be employed—because you cannot have a scientific professor from the London University, or King's College, or any place of that sort, to come and superintend every laying down of gas-pipes and putting on of gas—but whether, looking at the class of people who are fairly and properly employed in these matters, scientific propositions of that kind could have been expected to have been present to their minds. The jury took that into consideration, and, after some deliberation, they came in and said they were not agreed on the first point (nor was it material), but upon the second, they thought it was one of those inevitable accidents that might have happened to any one, and therefore the company were not responsible. It was a fair question for them. If they had decided the other way, I certainly should not have found fault with the verdict, so far as I was concerned; but they having decided in favour of the defendants, I see no reason to object to it.

Mr. HAWKINS: But could it be said that any person with the most superficial knowledge could fail to have known this? Because one must take it that the workmen actually engaged there in laying on the gas must be acquainted with the state of the premises.

Lord Chief Justice COCKBURN: If they had been aware that there had been an open window, or an open hole in front of that trench into which the gas was escaping, it would have been a different thing; but here is a grating at the side, which does not come in immediate contact with the trench, and that grating is nothing unless you connect it with the window.

Mr. HAWKINS: It is actually within half a foot of it. There are open windows within a foot of this very trench.

Lord Chief Justice COCKBURN: It is laterally placed.

Mr. HAWKINS: It is so; but it is placed in such a position that any person of the most ordinary superficial knowledge of the properties of gas, if he had taken the trouble to think for a single moment, would have been perfectly well aware that of necessity the gas must be sucked down into the basement because of the heated air in it.

Lord Chief Justice COCKBURN: Then the jury were the parties to judge of that.

Mr. HAWKINS: Yes, my lord; the jury are the parties to judge, but they must certainly judge having some reference to what is obvious to common sense; and really, when I come to call your lordship's attention to a passage in the evidence of some of the defendants witnesses, your lordship will see that they even felt the necessity for those windows being closed. [The learned counsel proceeded to read the evidence of Mr. Tully at the trial.]

Lord Chief Justice COCKBURN: Always bear in mind that these questions are put to witnesses after the event.

Mr. HAWKINS: Certainly, my lord.

Lord Chief Justice COCKBURN: A man would be very reluctant to admit to himself that he would not have taken a precaution which the event proved to have been one that it would be proper to take.

Mr. HAWKINS: Still, my lord, the witness is speaking not with reference to the event itself, but is assuming himself to be present on the spot.

Lord Chief Justice COCKBURN: I am quite aware of it; but then there is an element in the consideration of the question which, perhaps, is not always present to his mind; he is speaking after the event has shown that the precaution would have been necessary.

Mr. HAWKINS: That is the way in which the defendants put their case; but it is the only means one has.

Lord Chief Justice COCKBURN: I put that to the jury for you.

Mr. HAWKINS: I am much obliged to your lordship; but still I am calling attention to these witnesses to show what was the impression made upon them.

Lord Chief Justice COCKBURN: The strength of your case, I could not help thinking, was the presence of the lights at all—that the company's people, when they were going to suffer the gas to escape, ought to have insisted upon every light being put out, and declined to do their work till all the lights were extinguished. That did not appear to be the practice; and it was called prominently to the attention of the jury. I cannot help thinking the jury were very much influenced by the fact that the window through which it is plain the gas must have found its way into the lower premises, was below the surface where the men were at work, and that a man might have gone in there to see whether there were lights, and to see what was the nature of the premises, and have gone out again without paying very much attention as to whether the windows were open or shut. Then he comes to work above the basement; he digs his trench, probably not thinking much of what was below, and it turns out that windows were there. There were some bars through which it might probably have occurred to him that this fluid would have descended and got sucked into the window; but even a careful observer might have failed to note the particular circumstance out of which danger might arise.

Mr. HAWKINS: But your lordship will remember it was impossible that these men could fail to have observed the window, because the hole they made in the brickwork, for the purpose of inserting their pipe into the premises, was within a foot of it. It is not as if there was a partition at all which might have hidden the windows from view. There was nothing of the sort; it is an open space.

Lord Chief Justice COCKBURN: They could not have seen that window, except through the basement; it is through the grating.

Mr. HAWKINS: They had actually been in the premises, and this window is within a foot of the very hole which they made. One of the witnesses (Bicknell) stated that he had actually been in the basement itself within ten minutes before the explosion; and, my lord, I am told the window is very plainly visible from the outside. [The learned counsel read the evidence of Messrs. Hersey and Spice at the trial.] The four scientific witnesses who gave their evidence for the defendants, stated that, in their judgment, it would have been desirable to have these windows closed. Now, my lords, I have, on the part of the plaintiffs, a variety of affidavits. I have, first of all, the affidavit of Mr. Robert Hunt, who describes himself as professor of physics in the Government School of Mines, and Fellow of the Royal Society.

Lord Chief Baron COCKBURN: How many more actions are there pending?

Mr. HAWKINS: There are two more cases pending: there is another suit of Mr. Sturgeon, and there is the suit, I believe, of Mr. Morley himself; so that this question must of necessity be again raised. As your lordships will see, this is a question of vast importance to the parties. There was a considerable prejudice, as your lordships will see, created in this case.

Lord Chief Justice COCKBURN: The only thing which is present to my mind is this: This verdict, of course, would not be binding in the other cases.

Mr. HAWKINS: No.

Lord Chief Justice COCKBURN: As you are dissatisfied, you will most probably try another case?

Mr. HAWKINS: Most certainly.

Lord Chief Justice COCKBURN: If, in the result of the next case you try, you get a verdict for the plaintiffs, it would certainly be unsatisfactory to have the verdicts different in the two cases. We might, therefore, give you a rule *nisi;* but it would be clearly on this understanding, I think you should have to pay the costs; and, if the other verdict is the same way, we should discharge your rule. That will be the best way to put it.

Mr. HAWKINS: With reference to the costs, your lordship knows it is a point I abandoned, because, on looking into the matter, I found it was a question whether one could be non-suited after the jury came in.

Lord Chief Justice COCKBURN: You wanted to be nonsuited after the jury came in.

Mr HAWKINS: I did; but, on looking into the matter, I found that I could not after the jury had delivered their verdict. I thought it might have been before the verdict was recorded, but I found all the authorities stated that, after the jury had delivered their verdict, it was too late.

Justice HILL: You see, Mr. Hawkins, the court must take care not to express any dissatisfaction with the verdict, so as to prejudice the jury on the next trial.

Mr. HAWKINS: I understand your lordships will let me take a rule *nisi*, without expressing any opinion upon the subject, leaving the argument on the rule to stand over.

Lord Chief Justice COCKBURN: Yes, leaving the argument on the rule to stand over until after the next case has been tried: then the next case will be tried free of all prejudice. On this understanding, you may take your rule *nisi* on payment of costs.

Mr. HAWKINS: Certainly, my lord.

Justice HILL: Rule *nisi*, on payment of costs; not to be argued until after the trial of the next case.

Mr. HAWKINS: If your lordships please.

Miscellaneous News.

METROPOLITAN BOARD OF WORKS.

FRIDAY, JAN. 18.

The usual Weekly Meeting of the Board was held this day at Guildhall—Mr. THWAITES in the chair.

MR. SAMUEL HUGHES AND THE METROPOLIS GAS ACT, 1860.

Mr. HUGHES, according to notice, rose for the purpose of calling the attention of the board to the report of a meeting of the vestry of St. George, Hanover Square, contained in the *West End Examiner*, of the 5th of January, 1861, and asking Mr. Leslie whether his speech was correctly reported in that paper; also to ask the accountant whether the accounts laid before the finance committee relative to the Metropolis Gas Act, contain any grounds for the statement that Mr. Hughes's clerk had been paid a large sum of money, and that Mr. Hughes himself had received £220 from his own vestry? and to move "That a communication recapitulating these questions, and the replies of Mr. Leslie and the accountant, be addressed to the vestry of St. George, Hanover Square." He said he should have to trespass upon the indulgence of the board for a few minutes while he read from the *West End Examiner* an account of some proceedings which took place at St. George's vestry. On a motion being made for votes of thanks to Mr. Beal and Mr. Hughes, for their exertions in connexion with the passing of the Metropolis Gas Act, Mr. Leslie was reported to have said that he—

Must object to the vote, as it had come to his knowledge that the City of London was to be exempted from any portion of the expenses, although the City would be as much benefited as any par. of the metropolis. How could they pass a vote of thanks to Mr. Hughes, who had admitted at the Metropolitan Board of Works committee, that it was never intended by the delegates that the City of London should pay anything towards the expenses? He could show a charge of fifty guineas, by Mr. Drury, for drawing an Act which was so supremely ridiculous that it could not be brought in until completely altered. If Mr. Beal and Mr. Hughes were really entitled to a vote of thanks, let the vestry first have all the circumstances before it. There were rumours abroad that a large sum of money had been paid to Mr. Hughes's clerk, and also to Mr. Beal's clerk. This would have to be looked into. He advised the vestry not to be in a hurry. The bills sent in were to be examined and taxed. Mr. Hughes had taken himself off as a vestryman, after having received about £220 of the vestry's money for services and for work done for them.

This was the statement with reference to which he had given notice to ask the question. The impression created by Mr. Leslie on the minds of his own vestry was to the effect that he had authentically obtained the information for making these charges in his capacity as a member of the finance committee of that board, for when asked by Mr. Dowden as to where he got his information from, he replied—"I am on the finance committee of the Metropolitan Board of Works, and I found the charges in the account sent in by Mr. Beal." The impression created was very evident from the reply of Mr. Bertollacci; and, indeed, Mr. Leslie seemed to have gone further in his remarks than was reported in the newspaper referred to, for the former gentleman said, that "Grave charges had been made; Mr. Hughes had been libellously charged with accepting bribes;" to which Mr. Leslie rejoined, "I said that Mr. Hughes received £220 from his vestry for work that he had done, and that he had resigned." The "doubtful construction" which Mr. Bertollacci stated might be put on Mr. Leslie's remarks, arose from the mixing up of two things which had nothing to do with each other.

Mr. LESLIE complained that Mr. Hughes was interposing remarks of his own with the newspaper report, which would prevent the board from understanding which was which.

The CHAIRMAN said Mr. Hughes should confine himself to the question, whether the report referred to was a faithful record of what Mr. Leslie said.

Mr. HUGHES said he would do so, but he wished to place the whole matter before the board.

The CHAIRMAN: You had better ask your question first.

Mr. HUGHES said he had not as yet finished reading the report.

Mr. LESLIE submitted that the board had nothing to do with the matter, but he should raise no objection to the inquiry being made. At the same time, he thought he had a right to ask that the report be read in such a way that Mr. Hughes's speech might not be taken as a part of it.

Mr. HUGHES would put the question distinctly to Mr. Leslie, whether it was correctly reported that he had stated there were "rumours abroad that a large sum of money had been paid to Mr. Hughes's clerk;" and that "Mr. Hughes had taken himself off, as a vestryman, after having received about £220 of the vestry's money for services and for work done for them;" and that, as a member of the finance committee of the Metropolitan Board, "he had found the charges in the account?"

Mr. LESLIE said Mr. Beal had written a letter to him, which he replied to immediately, and which he would read.

Mr. PHILLIPS rose to order. Before any letter was read, or speech made, Mr. Leslie ought to reply to the question.

Mr. LESLIE said he was going to do so in his own way.

The CHAIRMAN: Is that a faithful report of your speech?

Mr. LESLIE said, as applied to Mr. Drury's bill, it was a correct report, and also as to the rumours respecting considerable sums having been received by Mr. Hughes's and Mr. Beal's clerks. He had replied to Mr. Beal's inquiry on the subject, and given that gentleman permission to make any use he pleased of the letter. Mr. Hughes did not apply to him on the subject, but wrote to St. George's vestry, and published his letter in the *West-End Examiner*, as did also Mr. Beal, but without giving his (Mr. Leslie's) reply.

Mr. FREEMAN objected to any further remarks from Mr. Leslie till Mr. Hughes had made his entire statement.

After considerable interruption and cross-questioning, Mr. Hughes proceeded to put the inquiry of which he had given notice to the accountant of the board.

Mr. HATTON said he had examined the accounts and vouchers laid before the committee relative the Metropolitan Gas Bill, and he found no evidence that any money had been paid directly to Mr. Hughes's clerk. Certain sums, amounting to £180, had been paid to Mr. Hughes for petty-cash expenses, and there was a sum of £40 paid to Mr. Hughes himself for personal travelling expenses in different parts of the country in getting up evidence. There was also a sum of £52. 10s. paid to Mr. Drury, but whether that gentleman was Mr. Hughes's clerk or not there was no evidence, and there was nothing to show Mr. Hughes's connexion with the transaction. With regard to the sum of £220, he could find no trace of such a sum having been paid by the Westminster vestry to Mr. Hughes.

Mr. LESLIE: Certainly not.

Mr. HUGHES said the £220 paid to him by his vestry had no connexion whatever with the Metropolis Gas Bill. He had been employed on the distinct requisition and resolution of his vestry, on a most laborious case connected with the rating of a public company, which resulted in the assessment of that company being raised from £4600 to £9000, and by which more than £700 a year was put into the pockets of the parish; and he need scarcely say that the vestry paid his charges very cheerfully and readily, the advantages of his labours being so great.

Mr. LESLIE said he had felt it his duty to reply to Mr. Beal's letter.

Mr. BIDGOOD: What have we to do with Mr. Beal's letter? The honourable member, as usual, is about to mix up half a dozen things together, and leave us in a glorious fog.

Mr. LESLIE said it had to do with the question, as he would show. It was perfectly true, as he had stated, that Mr. Hughes received £220, as a letter which he (Mr. Leslie) had received from the vestry-clerk would prove.

Mr. BIDGOOD: Your allegation is, that he received £220 in connexion with the Metropolis Gas Bill.

Mr. LESLIE: I said nothing of the sort, and the report does not say that I did.

The CHAIRMAN: You were discussing the costs and charges of the Metropolis Gas Bill at your vestry.

Mr. LESLIE: No; we were discussing the propriety of a vote of thanks to Mr. Hughes and Mr. Beal, and I had a perfect right to make the observations I did. I will now read a letter which I sent to the vestry-clerk of St. Margaret's, Westminster, on the subject:—

60, *Conduit Street, W., Jan.* 16, 1861.

To the Vestry-Clerk, St. Margaret's, Westminster.

Sir,—According to the business-paper of the Metropolitan Board of Works for Friday next, the 18th instant (copy enclosed), you will perceive, as I have marked it, that Mr. Samuel Hughes, who represents your district in that board, is to put

some questions to me in reference to a report in the *West-End Examiner*, of the 5th instant (copy enclosed and marked, of what is reported).

I have to ask the favour of answers to the following questions, at your earliest convenience, to enable me to meet the discussion that may then arise:—

1. Was Mr. Samuel Hughes the representative of your district at the Metropolitan Board of Works during the period that he was a vestryman of the parish of St. Margaret, employed in certain works and professional services, for which he had a claim on the rates of the parish?
2. Was the amount of the claim about £220, or what other sum?
3. Was the amount of that claim ordered to be paid by the vestry, and on what day?
4. Was the amount paid to Mr. Hughes, and on what day?
5. Is Mr. Samuel Hughes now a vestryman of the parish of St. Margaret, Westminster? or did he in writing resign that office, and on what day?

I shall submit your answers to my questions to the Metropolitan Board of Works, when the subject is discussed.—I have the honour to be sir, your most obedient servant, (Signed) J. Leslie.

To this letter, I received the following reply:—

Manchester Buildings, Westminster, S.W., Jan. 16, 1861.

Sir,—In reply to the somewhat formal questions contained in your letter of this date, I beg to state that Mr. Hughes was, during the time he was a vestryman of St. Margaret's, retained and employed by the vestry professionally in several appeals by the gas companies against the poor rates, for which he claimed and was paid £223, out of the poor rates.

This amount was paid to Mr. Hughes on the 24th of December last, by order of vestry of the 14th of December.

Mr. Hughes resigned his office of vestryman on the 18th of December.

I have no doubt Mr. Hughes would himself give this information; but, as I find it is required with a view to the proceedings at the Metropolitan Board on Friday, I have no hesitation in at once forwarding it.—Yours obediently,

John Leslie, Esq. (Signed) J. Rogers.

Mr. Hughes: That is perfectly correct.

Mr. Leslie said it would be seen from this that he could not possibly have supposed that this charge of £223 was in the accounts submitted to the board in reference to the Metropolis Gas Bill. Mr. Hughes, it appeared, was paid as a vestryman, and the moment he did so, he was liable to a penalty of £50. Mr. Hughes might laugh at that statement, but he would tell him that he had no right to sit as a representative vestryman, and receive any portion of the rates of the parish. If the honourable member had not read the 54th section of the Metropolis Local Management Act, he should advise him to do so. It appeared that Mr. Hughes had received, or was to receive, £40 out of the money which this board had to collect from all the parishes, and it certainly did not seem fitting for a representative in any board to occupy such a position. Mr. Hughes's services might be extremely valuable—perhaps ten times as great as he had represented—to his parish, but, as the law stood, he had no right to be a vestryman and at the same time perform services for which he was to be paid out of the rates. The letter which he (Mr. Leslie) wrote to Mr. Beal, and which was part and parcel of the same question, was as follows:—

60, *Conduit Street, Jan.* 7, 1861.

Sir,—In reply to your letter, received by post this morning, I urged the vestry of St. George, Hanover Square, on Thursday last, to pause until the enormous bills sent in by you to the Metropolitan Board of Works had been taxed by the officer appointed by the House of Commons.

You yourself have described in a letter—dated Dec. 14, 1860, read to the finance committee of the Metropolitan Board of Works—one of the accounts as "really too bad," and as "an absurd bill." I extend your observations on that account to other charges sent in by you to the Metropolitan Board of Works, and in the discharge of a public duty I have a right to do so. I did say there were rumours that both your clerk and Mr. Hughes's clerk had received considerable sums, but the name of either gentleman is unknown to me, and the taxation will prove or disprove the rumour. I also said there was a charge in your account for drawing a bill of £52. 10s., which bill was probably in accordance with your instructions, of such a supremely ridiculous character that it could not be presented to the House of Commons. I showed a copy of that bill to the vestry, with the alterations, but I did not tell the vestry what those alterations cost, because I did not know—the taxation may elicit the fact. Further, I did tell the vestry that the bill had so passed into an Act as to be supposed to except the ratepayers of the City of London on a rental of £1,280,000 from contributing to the cost thereof; and I said that I heard your colleague, Mr. Hughes, declare at the then last meeting of the Metropolitan Board of Works, that it never was the intention of the promoters of the bill to make the City of London liable to the costs.

You are at liberty to make any use you please of this letter.

I am, Sir, your obedient servant,

(Signed) John Leslie.

The letter which Mr. Beal sent to Mr. Cresy, referred to in the last communication, was the following:—

Estate and Auction Office, 209, *Piccadilly, W. London, Dec.* 14, 1860.

Dear Sir,—I return the bills. Mr. Dangerfield's is really too bad. He promised the delegates to do all for £5. It is true the work done was in excess of what that sum was to include; but it is an absurd bill.

Mr. Wyatt's is correct as to interview and facts. The charge must be left to the taxing office.—Yours truly, James Beal.

To C. Cresy, Esq.

Mr. Bidgood rose to order.

Mr. Leslie said he was publicly accused, and must defend himself.

The Chairman: The question is whether, when speaking of the amount received from the vestry, you were not referring to it—and it was so understood by your fellow vestrymen—of the expense of procuring this gas bill, or whether they distinctly understood that you referred to another matter?

Mr. Leslie: Certainly; it is perfectly clear. The vestry had not the power to pay Mr. Hughes.

The Chairman: His grievance is not that you stated so much was received from the vestry, but that so much was received in connexion with the gas bill.

Mr. Leslie: I never stated so, and it is not so reported. I did not state that large sums had been received by his clerk as a fact, but as a rumour which ought to be set at rest before the vote of thanks was given. (The honourable member referred again to Mr. Beal's letter, and in reference to Mr. Hughes's, said that gentleman was disgracing the board by sending letters to all the vestries asking them to subscribe 2s. each for a copy of his new pamphlet—"An Epitome of the New Gas Act.")

The Chairman (There being loud calls to order) said the honourable member had better confine his attention to the question in hand.

Mr. Leslie said he was doing so, and doing it in a proper manner. He was perfectly satisfied that what he had stated was true, although the report of it was necessarily condensed. He told the St. George's vestry that Mr. Hughes had received £220 from his vestry, and had since resigned his office, and he urged them to pause before they passed a vote of thanks to this gentleman, until they saw what the bill was, because he felt that a vote of thanks from that vestry ought to be looked upon as a great honour. (Laughter.) It was quite fair they should have the opportunity of ascertaining the nature of that bill, because he knew that it was a compromise between Mr. Beal, Mr. Hughes, and Sir John Shelley, as he gathered from the able report of the proceedings upon it, which appeared in the Journal of Gas Lighting. (Interruption.)

The Chairman: Good or bad, that is not the question before us.

Mr. Leslie: No, but it was an argument which I made use of in the vestry, that there was a compromise to get the bill passed, which compromise has begun already to entail upon the parishes enormous expense.

The Chairman: The question of the passing of this Act, good or bad, is not before us.

Mr. Leslie: But it was before the vestry. I think you have nothing to do with the whole question, and that it has been improperly introduced here to-day. But I do not object, although Mr. Hughes has taken the law into his own hands, and published a letter in which he characterizes me as a very eccentric individual, and says that I do not speak the truth. I tell Mr. Mr. Hughes now, publicly, as I have told him privately, that I doubt whether he is not liable to a penalty of £50 every time he sits here.

A Member: Inform against him.

Mr. Leslie: I am not a common informer; but I say the integrity and purity of this board are not to be maintained by persons who are receiving money out of the rates. There has been £40 already paid to him, and I could pick out many more items, and show that large sums have been paid under the head of petty cash, &c. I could show that £220 odd have been paid for copying documents for Mr. Beal; but, as I said to Mr. Beal in my letter, that will all come out in the taxation. If I felt that I had done one atom's worth of wrong, there is not a man in the board who would be earlier or readier to acknowledge it. I have made good my statement, and, if you choose to make any report to the vestry of St. George's, I shall confine my observations in reply to the documents I have read here to-day. Whether the rumours were false or true, I am bound to believe, after Mr. Beal's letter, that his clerk did not receive any sum of money. Mr. Hughes has not said that his clerk did not, but, whoever has been paid the money, you may depend upon it the taxation will be so strict that the fact will be elicited. An enormous sum of money has to be levied upon the ratepayers; the war has commenced again almost immediately, and we shall have a fresh stirring up of the whole gas question, by the very parties who compromised the matter.

Mr. Freeman, in unmeasured terms, denounced the conduct of Mr. Leslie in bringing these accusations against Mr. Hughes, and was called to order by

Mr. Eckett, who said he did not feel at all honoured in belonging to a board where such language was employed, either on one side or the other.

Mr. Freeman proceeded with his remarks, insisting that the object of Mr. Leslie, at the St. George's vestry, was to create the impression that Mr. Hughes had received the £220 for his services in connexion with the Metropolitan Gas Bill.

Mr. Leslie stoutly denied it.

On the motion of Mr. D'Ifanger, seconded by Mr. Bidgood, the clerk read again the report of the proceedings at the vestry.

Mr. Hughes said the whole discussion showed the interpretation which the vestry put upon the remarks of Mr. Leslie.

Mr. Le Breton then proposed the following resolution: "That this board is of opinion that Mr. Leslie's statement to the vestry of St. George's, Hanover Square, that Mr. Hughes had received £220 from his own vestry, was intended to convey the impression that such sum had been paid in reference to the Metropolis Gas Act, and, having heard Mr. Hughes's reply, is of opinion that Mr. Leslie's statement has no foundation in fact."

Mr. Peckett seconded the resolution.

Mr. Eckett, as an amendment, moved, "That the board do now adjourn," feeling that it was not their duty to sit there and try the merits of statements made by individual members in their respective vestries, unless such statements affected directly the transactions of the board.

The amendment was not seconded, and after several members had spoken on the subject of Mr. Le Breton's motion, it was put and carried by a majority of 11 to 4; and, on a division, 11 voted for the motion, and 1 against it.

The board then adjourned.

ROYAL SOCIETY.

Thursday, Dec. 6, 1860.

PURIFICATION OF COAL GAS FROM BISULPHIDE OF CARBON.

By the Rev. W. R. Bowditch.

[Communicated by Professor William Thomson.]

A distinguished Fellow of the Royal Society discovered coal gas, when rector of Crofton, about two miles from my present parish, and nearly all our knowledge of this complex substance is derived from the labours of chemists, who have been, or are, Fellows of the society. I feel assured, therefore, that an attempt to extend the knowledge of the reaction of coal gas with various substances will be favourably received, and that the application to practice of the facts made known, will not render a memoir less acceptable to the society which rewarded alike the abstract researches of Leverrier and the practical ones of Arnott.

Six years ago, I introduced the use of clay into gas-works for the purpose of improving the purification of coal gas, and now—after so long an experience, the purification of many hundreds of millions of feet of gas, and the use of many thousand tons of the refuse as manure—I venture, for the first time, to submit the grounds upon which my process is based.

Coal gas may conveniently be considered under the heads of carbon compounds required for the production of heat and light, which generate water and carbonic acid by their combustion; and sulphur and nitrogen compounds which are not necessary for heat and light, and ought to be removed from gas on account of the injurious nature of the substances produced by their combustion.

The former of these classes will be treated of incidentally; the latter class forms the principal subject of this paper. When speaking of *gas*, I always refer to that which has undergone the ordinary condensation of gas-works, wherefore no mention is made of the complex compounds removed by condensation.

When coal is distilled, its nitrogen is evolved in some forms of combination which are generally familiar, while others are almost unsuspected. Under certain conditions of distillation, much nitrogen leaves the retorts and passes the condenser as ammonia, or some of its salts. These are all removed from gas by clay, so that no trace of ammonia can be discovered, after gas has passed through purifiers charged with an adequate quantity of clay, and with lime or some equivalent substance to remove sulphide of hydrogen. Clay is thus entitled to be classed with acids and some metallic salts as a purifier of gas, for these, of course, remove ammonia and its salts. But between clay and acids there is an important difference, in regard to the action which takes place upon the most valuable light-giving constituents of the gas; acids remove a large quantity of these; clay does not. We have experimental proof that clay does not remove the valuable hydrocarbon vapours from gas, in the fact that strong spirit of wine, digested upon foul clay for days, does not thereby become much more luminous than it was before being so treated. The very slight light-giving power which it has obtained is due to tar; for, if the spirit be evaporated, and the tar so obtained be redissolved in fresh spirit, the same kind of flame will be

obtained as before; whereas, the addition of a small portion of coal oil to spirit gives a flame of considerable illuminating power. To this I may add, that long and extensive experience shows that the employment of clay in the purifying process improves the light-giving power of gas, by removing substances which are not otherwise removed, and which, if allowed to be burnt with the gas, lessen its illuminating power. These light-damaging compounds are produced during the later portion of the distillatory process, as I have proved by experiment. The same retort was charged twice with the same weight of the same coal. The gas produced by one charge was purified by lime only; that produced by the other charge was purified by lime and clay. The illuminating power of the gas passing at each half hour's end was determined, and it was found that the purification made no difference for the first three or four half hours. About the middle of the charge, that purified by my process had slightly the advantage, and at the close the difference in favour of that purified by the addition of clay has been found as much as 10 or 12 per cent. Thus it is shown that the compounds removed by clay from gas produced during the early stages of distillation—however objectionable on other accounts—do not lessen the light-giving power of gas; whereas, those removed during the later periods of distillation, reduce the light-giving powers considerably.

If conjecture be allowable, I would venture an opinion that cyanogen compounds, and other nitrogenized substances with which foul clay abounds, are those which lessen light. My own investigations lead directly to this inference, and, I think, explain an old table by Dr. Henry in this sense. In the "Philosophical Transactions" for 1808, he shows that the gas produced from 112 lbs of cannel coal contained, after purification, the following quantities of nitrogen:—

Hours from commencement of Distillation.	100 Measures of Purified Gas contain Measures of Nitrogen.	
½ an hour ...	20	Due chiefly to atmospheric air.
1 hour	4½	Probably the time when ammonia was principally produced.
3 hours	5	
5 "	15	Probably vapour of water was present in very small quantity, and cyanogen and related compounds were produced in increasing quantity.
7 "	15	
9 "	15	
10½ "	20	
12 "	20	

Without assuming the absolute accuracy of these figures, we may regard them as valuable indicators, pointing, I think, in the direction I have ventured to conjecture.

A beautiful reaction furnishes experimental proof of the damage done to gas by acids. Clean deal sawdust is well moistened with pure sulphuric acid, diluted with five or six volumes of water, so that the sawdust may not be discoloured, and gas is passed through it in a slow stream. With rich gases, which give the light of from 20 to 25 sperm candles for a consumption of 5 feet an hour, the sawdust instantly changes to a most beautiful pink colour, and the tint gradually deepens until the whole becomes of a dark mahogany. With poor gases, which give the light of from 10 to 12 candles, this colouration is exceedingly faint at first, and deepens very slowly. The differences of colouration are so considerable and constant, that I have no doubt of the possibility of thus determining the value of gas as an illuminant. By using a standard acid, the same kind of sawdust, a uniform volume of gas, and the same sized U-tubes, notation of time and depth of colour would give a close approximation to the illuminating value of the gas. At all events, the sources of error are not greater than those of photometry in the hands of all but the most experienced, and the process is quite as close an approximation to truth as an ultimate analysis of gas, containing, as it does, impurities which render skill and precaution useless. A comparison of the analysis of coal gas given in "Bunsen's Gasometry," with the substances now known to exist in gas, will convince us that at present we cannot attach any value to such analyses.

To determine the substances in gas which produce this colouration, some of its chief illuminating constituents were prepared and passed separately through the acid sawdust.

Olefiant gas made in the usual manner, and carefully purified, reddens the acid sawdust. Ether vapour does not affect it, and therefore need not be removed from the gas for this experiment.

Propylene, produced by passing the vapour of fusel-oil through a red-hot combustion-tube filled with cast-iron nails, but kept at so low a temperature that a small portion of oil passed over without decomposition, reddened the acid sawdust.

Commercial benzole, with the exception of one specimen, reddened the acid sawdust.

I have not yet had leisure to prepare and test acetylene.

The colouration of fir-wood, moistened by hydrochloric acid, has been mentioned by Williams as characteristic of pyrrole.

To show that the colour was produced by illuminating matter abstracted, some sawdust was treated with acid strong enough to char it slightly;* and gas, which instantly reddened the clean sawdust and dilute acid, was passed first through the black and then through the clean acid sawdust. No colour was produced in the latter, though the flow of gas continued for an hour.

Hydrochloric may be substituted for sulphuric acid, so far as that gas colours sawdust moistened with it, but it is liable to a considerable disadvantage. If gas contain ammonia, the vapour of the acid unites with it in the tube before the gas comes into contact with the sawdust, and the result is a deposit of chloride of ammonium on the surface of the sawdust where the colour commences, which renders the observation less precise and easy. Olefiant gas likewise does not redden this acid sawdust, and therefore cannot be estimated by it.

Nitrogenized compounds in coal-gas present the greatest difficulty in the way of efficient purification, and the almost impossibility of obtaining them in a state fit for examination, renders their investigation laborious and unsatisfactory. Much nitrogen is contained in gas as cyanogen, which can be separated from the clay used in purification. Probably not much less exists as sulphocyanogen, which can be separated from the foul clay with ease, and the presence of further quantities in combination with sulphuretted hydrocarbons and tar can be demonstrated. The bodies formed by this combination of elements are, I believe, unknown at present.

By placing clay in a purifier through which crude gas passes from the condenser of a gas-work, and treating the saturated clay with spirit, a solution is obtained, of a brown colour, which has no effect upon litmus, turmeric, or lead-paper, which decolorizes a solution of iodine, and from which nitrate of silver throws down a white or brownish white precipitate, and acetate of lead a white precipitate. The aqueous solution possesses the same properties, and, like the solution in spirit, is always neutral. Litmus paper, immersed in either of the solutions and exposed to the air, becomes quickly, strongly, and permanently reddened. Soluble sulphides have been tested for repeatedly with nitroprusside of sodium, as well as with acetate of lead, but have never been found; yet a sulphur compound exists in solution which possesses the power of forming a sulphide with metallic mercury. The spirit solution, digested on mercury, with occasional shaking, produces the black sulphide of mercury, while the aqueous solution, similarly treated, produces the red sulphide. Insoluble sulphides, however, exist in the foul clay, and evolve sulphide of hydrogen on the addition of an acid. These insoluble sulphides are oxidized rapidly by exposure of the clay to atmospheric action.

A solution of clay in spirit was treated with an excess of powdered acetate of lead, and the white precipitate filtered off. The brown filtrate was supersaturated with ammonia and filtered. The clear brown filtrate, diluted with twelve times its bulk of water, became milky, and with much difficulty was obtained clear by filtration. Part of the spirit was then distilled off, to ascertain whether it would bring over a volatile sulphur compound; but the spirit was quite free from sulphur. The remaining fluid was then acidified with nitric acid, which caused brisk effervescence and a strong smell of hydrocyanic acid. Nitrate of silver was added as long as it continued to produce a precipitate; the precipitate, dried and heated, gave off cyanogen, which burnt with its characteristic flame. The clear filtrate, slowly evaporated to dryness, left a pale yellow crystalline mass, which did not change colour by several days exposure to light. Part of this, burnt in a porcelain crucible, gave off nitrous fumes, and left a considerable residue blackened by oxide of silver. Water was added to this residue, and the oxide of silver filtered off, and an abundant precipitate of sulphate of baryta obtained, with a salt of baryta. The remainder of the yellow salt was redissolved in water, with a view to separate a granular portion which was mixed with the more perfectly crystalline salt, but an accident unfortunately spoilt the remainder, and rendered any further progress impossible.

Sulphocyanide of ammonium may be obtained in considerable quantity from an alcoholic solution of foul clay. Upon one occasion, I obtained nearly an ounce, in a fair state of purity, from less than a quart bottle of foul clay; and so tenaciously does clay retain this compound that, from some clay which had been exposed to the full action of the weather in a field for two years, I obtained a considerable colouration with perchloride of iron. Sulphocyanide of ammonium may be obtained from gas which has been purified by oxide of iron, by passing the gas through spirit of wine, and evaporating.

When common yellow brick-clay is used in the purification of coal-gas, the solutions from it always contain salts of iron, but they never become of a blood-red colour until a mineral acid is added. When, however, the solutions are evaporated, and the deliquescent residue is exposed to the air, most, and sometimes all of the iron is peroxidized, and yields the well-known reaction.

The nitrogen in tar may be shown from the spirit solution off foul clay. The spirit, evaporated to dryness and allowed to stand, deposits tar and a mixture of deliquescent crystalline salts. They were allowed to deliquesce, the fluid was removed, and the residual tar well washed with water. Subsequently, it was dissolved in hot spirit, precipitated by water, and well washed. When nothing more was removed by washing, the tar was heated, and evolved sulphide of hydrogen and ammonia. Contrary to every other compound in gas with which I have experimented, this tar gave off sulphide of hydrogen before ammonia. In other instances, I have found the nitrogen compound evolved at a lower temperature than the sulphur one.

Mineral matter derived from the clay is found in all solutions; but, as my object in this paper is to speak only of substances in gas, I purposely omit those united with them derived from the clay. For the same reason, I make no mention of the value of the foul clay as a manure.

Sulphur Compounds in Gas Purified so as not to affect Basic Acetate of Lead, and their Removal.

A recent Royal Commission on lighting picture galleries has stated the large quantity of sulphur found in some London gas, and has intimated a doubt about the possibility of its removal. Dr. Letheby concludes, from seven years examination of gas in London, that, though quite free from sulphide of hydrogen, it contains, on an average, 200 grains of sulphur in 1000 cubic feet; and Dr. Frankland, in the new edition of "Ure's Dictionary of Arts, part iv. pp. 730, 731, writes, "It is probable that volatile organic compounds of sulphur are produced by the action of this element with carbon and hydrogen simultaneously, although we have as yet no positive evidence of their presence in illuminating gas. . . . When once generated with coal gas, all attempts to remove these constituents have hitherto proved ineffectual, and there seems little ground for hope that any practicable process will be devised for their abstraction." I have now the honour to submit evidence of the existence of these sulphurized compounds, and also a practical process for their removal. My attention was specially drawn to this subject by a conversation with the manager of a London gas-work. He informed me that he not unfrequently filled his gasholders with gas which would not affect acetate of lead, and that after the gas had been stored a few hours, it became so foul as to blacken lead paper the instant it was applied. He sought an explanation of this phenomenon; and, as the water of his gasholder tanks was clean, and there were no accidental sources of sulphide of hydrogen, I concluded that an organic compound, containing sulphur and hydrogen, had been broken up, and that the sulphide of hydrogen was thus produced. I learnt also, by other observations, that gas which went to the gasholders free from ammonia, sometimes became ammoniacal if kept, and joining this fact with the former one, inferred that the compound which thus broke up contained nitrogen as well as sulphur and hydrogen. Subsequently, I observed that the saturated clay taken from the purifiers of gas-works, contained a quantity of foul naphthalin. This led me to procure a quantity of (so called) naphthalin which had been taken from the mains of a London gas-work, and which, therefore, must have been deposited by purified gas. Some portions of this naphthalin were white, but others were slightly darkened by the presence of carbonaceous matter, and the whole was in *fine powder*, aggregated together by the process of deposition. The tendency to form exceedingly small crystals seems a constant characteristic of naphthalin which has been deposited in gas-pipes, for by no amount of care and trouble have I been able to obtain it in large crystals, though the solutions from which it has crystallized have been months in evaporating. With naphthalin from tar, on the contrary, I have obtained, from an etherial solution, crystals an eighth of an inch thick, nearly half an inch broad, and more than half an inch in length. The supposed naphthalin from gas-pipes dissolves wholly in ether and hot alcohol, and crystallizes from the spirit on cooling as pure naphthalin does. The solutions are neutral to test papers. Boiled with an alcoholic solution of potash, it evolves no ammonia, and with hydrochloric acid no sulphide of hydrogen. Heated alone, it evolves first ammonia, and

* This acid was of the same strength as that used in some gas-works.

then sulphide of ammonium, mixed, I think, with a trace of bisulphide of carbon, and then distils. Several samples began to give off their ammonia at 388° Fahr., and sulphide of hydrogen at 422° Fahr., leading to the hope that here was a compound of definite composition which would admit of correct analysis and perhaps of formulation; but some more of the naphthalin, produced, like the other, from Newcastle coal, but at another gas-work, possessed such different physical properties as to convince me that very much more must be known of this substance before any reliable analyses can be published. The latter sample gave a neutral solution in spirit, like the other, but of a considerably browner colour. When heated alone, it gave off ammonia with ebullition at 218° Fahr., and then became tranquil. When the temperature reached 375° Fahr., it began to evolve sulphide of hydrogen, which continued to increase in quantity up to 390° Fahr., when it nearly ceased, and quite ceased at 410° Fahr. The proportion of tar in this sample was much greater than I have seen it in any other. Subsequently, I obtained some more naphthalin which had been deposited in the pipes of another London gas-work, and this, like the former, contained both nitrogen and sulphur, which were evolved upon distillation as sulphide of hydrogen and ammonia.

Having thus obtained one sulphurized hydrocarbon, and determined the temperature at which its sulphur and nitrogen could be obtained as easily as removable compounds, I was prepared to advance towards a better purification of gas, with great probability of success. Another well confirmed observation helped to guide me. Gas, freed from every trace of sulphide of hydrogen, always blackens lead-paper strongly when passed through clay; and, if it be subsequently passed through lime, it affects turmeric, though quite free from ammonia when taken for experiment. This process may be repeated through a series of ten or twelve purifiers, containing clay and lime placed alternately, the test-papers being less affected at each purifier, until at length they are not discoloured at all. This experiment has been made upon gas produced in various parts of England and Scotland from many kinds of coal, and I think the number of instances sufficient to justify the conclusion that *all* gas, as sold, contains the compound from which clay liberates sulphide of hydrogen. I have not yet been able to separate the compound upon which clay thus acts. I have, however, ascertained that the clay which has liberated sulphide of hydrogen from gas which did not affect test papers when taken for experiment, contains tar, which may be dissolved out by alcohol, and may be obtained alone by evaporating the solvent.

Although collateral matter has been carefully excluded from this paper, I cannot refrain from remarking that the property of clay here mentioned is in fact the announcement of a new property of soils, and one which will help to account for the formation of many natural metallic sulphides. I hope soon to have some investigations of this subject ready for publication.

To ascertain whether this property of breaking up a sulphurized compound in purified gas and removing tar, was possessed by clay alone, or shared by other substances used in purification, some purified gas was passed through a considerable chemical excess of all the substances employed in purification—viz., lime, precipitated peroxide of iron, sulphate of iron, chloride of calcium, and dilute sulphuric acid, all but the lime being mixed with moist sawdust. Upon passing the gas next through a purifier filled with clay, it darkened lead-paper, and affected turmeric when it had passed a subsequent purifier filled with lime. This proves the power of clay to break up one or more sulphurized compounds, which no other substance used in purification effects; and if this sulphur were not liberated from the impure naphthalin compound already mentioned, it seemed certain that gas which had been previously purified by clay might be much improved, if not rendered pure, by a removal of the sulphur of the naphthalin. There is strong experimental evidence that the compound from which clay liberates sulphide of hydrogen is not the sulphurized naphthalin one; for, if hydrogen be passed through a vessel containing this substance, then through clay, and subsequently over lead-paper, no trace of sulphide of hydrogen is found, though the gas passing smells strongly of impure naphthalin. This gas and vapour burn with a lightless flame. Subsequently, some naphthalin was heated to ebullition, and a current of hydrogen sent through it, and then burnt. The flame was lightless as before. I mention this fact to remove the popular error that naphthalin, as it exists in coal gas, is a good illuminant. Even Dr. Franklin thus regards it; and both in Clegg's book on coal gas, and in the new edition of Ure's Dictionary, states that the hydrocarbons in gas are valuable in proportion to the carbon they contain, and that naphthalin is the most valuable as containing the largest proportion of carbon. The above-mentioned experiments evince the contrary. On another occasion, I determined the illuminating power of some gas, and then, without alteration of the quantity passing, sent the gas through a U-tube, containing naphthalin from the London gas mains. The character of the flame was changed from white to red, but the photometer indicated no difference in the light given. Two other persons conversant with photometry were present at this experiment, and agreed in the result, though up to that time they had held the prevailing opinion as to the value of naphthalin in gas, without testing the statements made upon the subject.

Another sulphur compound is said always to be present in coal gas and to be irremovable, and which like those I have hitherto spoken of, does not affect lead-paper—viz., bisulphide of carbon. To ascertain the presence of bisulphide of carbon, I pass gas through strong spirit of wine (methylated spirit answers perfectly), kept at about 160° Fahr. The gas and vapours pass out of the flask which contains the spirit, up a long tube, into an inverted flask, so that all which is condensed may run back into the spirit. It then passes into another flask, for additional condensation, and thence, forward, to a gasholder or burner. Bisulphide of carbon, dissolved in spirit, becomes precipitated as a white cloud, which settles to the bottom of the vessel, when the spirit is copiously diluted with water. The white, cloudy precipitate escapes slowly by single bubbles through the diluted spirit, and at length leaves a solution perfectly clear. The spirit through which gas has passed, and from which it has abstracted bisulphide of carbon, acts in precisely the same manner upon dilution, and no one who has seen the reaction once or twice can possibly mistake it. The study of other compounds led me to conclude that, if this substance exist *as such*, and not merely *by its elements*, in gas, it could be removed almost as easily as the naphthalin compound could be purified, and that the same process could be made available to remove the sulphur of both. I thought that, under certain conditions, the affinity of hydrogen for sulphur would exceed that of carbon for sulphur, and, therefore, that I might obtain the sulphur of bisulphide of carbon as a sulphide of hydrogen, about the removal of which there is no difficulty. Experiment confirms the reasoning. When hydrogen, mixed with vapour of bisulphide of carbon, is passed through a tube filled with slaked lime or clay, which has been dried at 400° or 500° Fahr., and is kept between 400° and 600° Fahr. during the passage of the gas and vapour, not a trace of bisulphide of carbon passes from the tube, but sulphide of hydrogen does pass. The lime is darkened by a deposit of carbon, and a sublimate of sulphur is found in the exit-tube. A considerable excess of hydrogen should be used, or else a portion of the bisulphide of carbon vapour is carried over by the current, and escapes decomposition. That this reaction is not the result of heat merely, but is a truly chemical one, which the base, under the influence of heat, effects; and the remarkable fact, that slaked lime, when heated, forms, but does not unite with, sulphide of hydrogen, receive illustration from the following experiments:—

Hydrogen and vapour of sulphide of carbon were passed through—1, cold slaked lime; 2, cold clay; 3, hot oxide of iron used at a gas-work in purification; 4, hot broken bricks; 5, hot broken glass, without, in any instance, producing sulphide of hydrogen. On the contrary, when passed through (1) hot lime and (2) hot clay, sulphide of hydrogen was formed and passed over immediately, and continued to pass as long as the current was kept up. The lime, when cooled out of contact with the air, gave no sulphide of hydrogen upon being supersaturated with dilute sulphuric acid, but clay, when thus treated, gave off much.

The hydrogen used was in all cases passed through lime and over lead-paper, to secure its being free from sulphide before use. On one occasion, when the clay had been imperfectly dried before heating, I observed much sulphurous acid, instead of sulphide of hydrogen. I therefore passed hydrogen, bisulphide of carbon vapour, and steam over hot clay, which had been properly dried. At first, sulphide of hydrogen passed over alone, then mixed with sulphurous acid, which at length passed alone. Subsequently, sulphide of hydrogen passed, and at length sulphurous acid ceased. As the one gas increased, the other diminished, and throughout the experiment, sulphide of carbon vapour passed undecomposed. It is shown by this experiment, that hot clay, in the presence of more water than forms a hydrate, acts very differently from the same clay when dry, and the whole subject deserves a full investigation.

Action of Sulphide of Hydrogen upon Clay and Lime, Cold and Hot.

Well-washed sulphide of hydrogen, passed into cold slaked lime (obtained from Buxton) in a tube, colours the lime green as soon as it comes into contact with it, and the progress of the gas along the tube corresponds with the colouration. Lead-paper is not affected until the lime becomes coloured close up to the exit.

The same gas, passed into a tube containing slaked lime, kept about 600° Fahr. at the middle, but cool at both ends, acts differently. The cool lime at the inlet end becomes coloured; the hot lime in the middle remains white; and the cool lime at the exit end becomes coloured, and lead-paper is stained as soon as these two cool portions are saturated, while the middle portion remains unchanged in colour.

The same gas, passed into a tube containing hot lime only, causes no discolouration, but instantly blackens lead-paper placed at the exit end; and, upon being conducted into a tube of cold lime, colours it as if it had just passed from the vessel in which it is produced.

The same gas was passed into a tube containing lime, which had been thoroughly dried at 600° Fahr., and cooled out of contact with the air. No discolouration of the lime took place, but the gas passed unaffected by the lime, and blackened lead-paper. Water added to the lime gives it the power of decomposing the gas as if it had not been heated. The presence of more water than is necessary to form hydrate of lime (Ca O, HO) is thus shown to be required for the decomposition of sulphide of hydrogen by slaked lime.

Sulphide of hydrogen passed into a tube of cold clay is taken up in considerable quantity, and the clay becomes black from the formation of sulphide of iron. The blackening begins at the inlet end, and progresses with the passage of the gas towards the exit end of the tube.

The same gas, passed into clay, heated to 500° or 600° Fahr., gives the same reactions; but, when the clay has been heated and well dried, and cooled in the closed tube, it takes up a very small quantity of the gas.

Coal gas, quite free from sulphide of hydrogen, when passed through hot lime, blackens lead-paper, showing that masked and hitherto irremovable compounds have been so altered as to be easily removable. The lime does not take up sulphide of hydrogen, but becomes gradually, yet very slowly, darkened by the deposition of tar and carbon from vapour of bisulphide of carbon. The reaction with previously dried slaked lime commences at 108° Fahr., and continues through the whole range of temperature up to redness. At a red heat, the sulphur of the bisulphuret of carbon and other sulphur compounds unites with the lime and forms sulphide of calcium. Practically, very high temperatures are useless, as the hydrocarbons of gas begin to be decomposed about the melting point of lead, and to deposit their carbon upon the hot lime. Fortunately, injurious temperatures are not required. I have frequently freed gas from every trace of sulphur, so that upon combustion no sulphurous acid was generated, by employing lime so heated as not to deposit any carbon, and removing the sulphuretted hydrogen evolved in the hot tube by ordinary hydrate of lime.

The same gas passed through hot clay gradually darkens the clay by forming sulphide of iron; and, when the blackness has reached the end of the tube containing the clay, lead-paper is blackened by the passing gas. The clay, treated with an acid, evolves sulphide of hydrogen. Carbonic acid is evolved in both cases. It is thus proved that bisulphide of carbon, in the presence of hydrogen passing over hot hydrate of lime, is decomposed, and that its sulphur becomes united to hydrogen. Coal gas always contains a considerable quantity of hydrogen, so that, if it contain vapour of bisulphide of carbon, the process I have the honour to describe will effect its removal. The same process will break up the impure naphthalin compound, and convert its sulphur into sulphide of hydrogen; and the employment of clay in the ordinary purifiers, before the gas passes through the hot ones, will so arrange the elements of certain other sulphur compounds as to enable the manufacturer to remove their sulphur as sulphide of hydrogen. Sulphocyanide of ammonium is decomposed by the heated lime, and its sulphur is liberated as sulphide of hydrogen. The only requisite for complete success was that no injury should be done to the light-giving materials of gas while removing the impurities. I have passed the principal illuminating constituents of coal gas through the hot lime and clay, and find that they are not injured. The temperature which suffices for purification is not high enough for injury. The photometer shows that coal gas is not injured.

The quantity of tar in gas as applied to consumers, and the evil of its presence as a source of sulphur, are not considered as, I think, they deserve to be. It is exceedingly rare to find gas free from tar, and I never yet met with tar which did not contain both nitrogen and sulphur. Part of this tar is combined with ammonia in some manner, and may be obtained by passing gas through a bottle containing pebbles moistened with hydrochloric acid. Part is united to naphthalin, as I have already mentioned; part is united to benzole vapour, and part to other hydrocarbon vapours, such as paraffin, if two instances within my own knowledge be sufficient to justify a statement in reference to gas in general. In one instance, I

passed gas through a metal vessel filled with a number of wire-gauze diaphragms, and kept below 32° Fahr. Some cakes of solid paraffin were found floating upon the water which had been placed in the vessel before commencing the experiment, and a mixture of tarry oils which had deposited the paraffin. In another instance, an old gasholder was about to be replaced by a new one, and on the water of the tank in which the old gasholder had worked, there were found upwards of a thousand gallons of a dark-coloured fluid. All but two carboys was sold to a tar distiller. These two carboys were left exposed to the air, without corks, for some time, and when the manager of the gas-work went to get some of the fluid for examination, he found that the whole contents had evaporated. I had previously, however, obtained about half an ounce of the mixture. It contained paraffin, naphthalin, and the oils which accompany paraffin. Nearly a fifth of its weight of solid pitch was obtained by distilling off the hydrocarbons. A quantity of sulphide of hydrogen and ammonia was evolved during the distillation, and some of the most stinking compounds I ever met with produced from coal. From these two instances, it is clear that some, or perhaps all, of the volatile hydrocarbons in gas possess the power of upholding tar with them in their vapours; and it is proved that this tar is no inconsiderable source of the sulphurous acid produced by the combustion of gas as at present purified. I have obtained tar containing sulphur from every specimen of commercial benzole I have examined; and, as this will evaporate at common temperatures without leaving a residue, we are justified in the presumption that tar thus united to benzole exists in gas.

The best method of showing the tar in gas is to pass it through or over well-purified coal oil, and subsequently through a good condensing arrangement. I have known colourless coal oil become of a dark mahogany colour, and have separated sulphuretted hydrogen, ammonia, and solid pitch by distillation.

ON THE PRESENCE OF ARSENIC AND ANTIMONY IN THE SOURCES AND BEDS OF STREAMS AND RIVERS.

By Dugald Campbell, Esq.,
Analytical Chemist to the Hospital for Consumption, Brompton.

[From the *Philosophical Magazine.*]

Some months ago, I had a specimen of iron pyrites from coal—or coal pyrites, as it is familiarly called—sent to me, to examine for arsenic, and I was somewhat surprised to find in it the quantity of arsenic which I did, arsenic not being generally set forth in the analyses which I have seen of such pyrites, although my own impression was that, if looked for in a proper manner, it would be found.

Having been informed that the coal associated with this pyrites crops out in the beds of the streams and rivers of the district from which my specimen of coal pyrites was sent, it occurred to me that if the sand from the beds of such streams or rivers were carefully examined, arsenic would be found in it.

Having obtained a specimen of the sand, after a great many experiments (for I was at first beset with difficulties about the purity of the various materials I used in my examinations, and other causes), I at last succeeded in obtaining arsenic from it in every experiment, and really in notable quantity.

Besides arsenic, I also got antimony, which I had not observed in my coal pyrites, although it may very likely have been there in small quantity.

The quantity, however, of both the arsenic and the antimony appearing so considerable in this specimen of sand, induced me to think that their occurrence was due to other sources besides the coal pyrites, and led me to the opinion that I should find these metals in the sand from the sources or beds of most streams or rivers in greater or less quantity, depending upon the geological formation from which such sand had its origin; and, after making several experiments, I found my views confirmed in this respect; and in every specimen of sand from these sources which I have hitherto examined, I have obtained arsenic, and generally also antimony; and, as I had supposed, in some instances the arsenic was in considerable quantity, in others in small quantity, but in no instance is its presence in a doubtful quantity.

I say, "generally also antimony," although it is more than likely that antimony exists in every specimen of sand which I have examined; but the process I followed was especially for arsenic, not for antimony, although, as I have stated, I very often got some antimony at the same time with the arsenic.

Although I speak of the arsenic being in greater quantity in the one sand than in the other, this is observed as yet only by qualitative tests. I have not directly estimated quantitatively the arsenic in any one instance; nor do I think that, by the process which I follow to detect the arsenic, and which I shall give, should I get, in most instances, if not in all, anything like the quantity which the sand contains.

The process which I adopt is as follows:—The sand is first dried by means of a bath at not too high a temperature, and sifted, if necessary, through a coarse sieve, to remove anything larger than sand; the portion for the experiment I then weigh out. I seldom require more than two ounces of the dry sifted sand. I then ascertain that my hydrochloric acid is free from arsenic (or rather how far it is contaminated with it, for it is rarely indeed that this acid is found entirely free from arsenic), which I do by introducing into a drachm of the acid diluted with about three drachms of distilled water, when brought to boil in a small flat-bottomed flask, about the eighth of a square inch of bright copper-foil, specially prepared as free from arsenic as it is possible to be obtained,* and gently boiling the same from about half an hour to three quarters or so, avoiding much evaporation by having a small funnel in the mouth of the flask. Should this piece of copper get coated with arsenic, I take it out and replace it by a similar piece, and boil it in a similar manner; should this piece likewise get coated, I should scarcely like to use such impure acid; but if no coating has taken place, or only one piece was coated, I measure out into a small flat-bottomed flask (a flask capable of holding about three liquid ounces is the size I prefer), half an ounce of the acid, and gradually add to it the two ounces of the dry sifted sand. I now close the bottle with a cork, and allow it to stand for some hours, until the acid has thoroughly penetrated the sand, and at once attach, by means of a perforated cork, a bent tube about three feet long, leading into a receiver through a cork, a little loose at first, but capable of being made tight afterwards, the receiver being placed in water. Heat is now applied by means of a sand-bath, gently at first, gradually increasing when the cork at the receiver is made to fit tight. I also apply wet rags or bibulous paper down the tube. In about an hour, the greater part of the distillate will have passed into the receiver, when it may be detached. The distillate, which varies in quantity according to the nature of the sand, I measure. I have found it to average 190 grains; but, as stated before, it varies in quantity according to the nature of the sand.

The test which I generally first apply is the copper one, exactly as I have described in testing the acid, only, instead of a drachm, I use a less quantity, proportionate to the acid used and the distillate obtained. After one piece of copper is coated, it is withdrawn and another substituted, and so on until no more coating takes place; much evaporation of the liquid is made up from time to time by a little boiling water.

When antimony is in the distillate, it deposits more readily than the arsenic upon the copper, and the first pieces coated have more of a purple or blue tint than the steel-grey colour of the arsenic.

The remainder of the distillate may be tested by a Marsh's apparatus, heating the gas as it passes through a quill tube drawn to a fine point, in order to get the metallic arsenic deposited upon the tube.

The metallic arsenic, deposited in this way from the residue of the distillate from two ounces of the sand, is in many instances of sufficient quantity to dissolve or sublime and examine by other tests.

The sands which I have examined have been selected with much care; and in most cases, when taken from the beds of streams or rivers, they have been taken above where they could receive contamination from coal pits or works, or contamination of any description whatever. I append a list of them, in order that any one may repeat the experiments.

I am indebted to Mr. Woodcroft, of the Great Seal Patent Office, for the first eight specimens, and to Mr. George Phillips, of the Inland Revenue Laboratories, for the next four specimens, both these gentlemen having taken much interest and trouble in the matter. For most of the other specimens I am indebted to kind friends, and one or two I have procured myself.

List of Sands examined.

From Cragg Hall, Cheshire.
From Black Brook, which falls into the Dane, Staffordshire.
From the source of the Wye, the Buxton Water supply.
From the source of the Goyte, Derbyshire.
From the Oaks Clough Redmires, supply of Sheffield.
From the source of the river Porter, Fulwood, Sheffield.
From the Hog Shaw Brook, Buxton.
From the source of the river Dove, Derbyshire, where it issues from a compact limestone rock at Mr. Marsden's Dowal.
From Middle Lake, Dinish Island, Killarney, Ireland, county Kerry.
From Flesk River.
From Flesk River, Killarney, Ireland, county Kerry.
From Ogiven River, near Penrhyn Slate Quarries, about four or five miles from the outlet of Ogiven Lake, Carnarvonshire, North Wales.
From Snowdon, 100 yards above the Ceunant Maur Fall, Carnarvonshire, North Wales.
From the junction of the rivers Kinder and Sett, Derbyshire.
From the Brent, two miles below Apperton Bridge.
From the Thames, a quarter of a mile above Teddington Lock.
From the Mardyke, near Stifford, Essex; falls into the river Thames at Grays.
From the river Lea, Essex, 300 yards above the East London Water-Works.
From brook emptying itself into the Wrike, Melton Mowbray, Leicestershire.
From Ladies Well Spring, Pitlour, Fifeshire, Scotland.
From Garden Brook, Pitlour, Fifeshire, Scotland.

Although in my experiments I have not yet met with a sand from the source or bed of a stream or river that does not contain arsenic, and perhaps antimony also, yet, judging from the exceeding variability in the quantity of each, I am far from thinking that sands will not be found, though I should say they will be few in number, that will not contain these metals.

* I have lately examined a great many specimens of copper said to be free from arsenic; of these, eight specimens were electrotype, but in all I found arsenic.

THE USE OF SAPONINED COAL TAR IN PHARMACY.

By M. Le Maire.

[From the *Comptes Rendus.*]

M. F. Lebeuf, pharmaceutical chemist of Bayonne, remarked, as early as 1850, that substances insoluble in water and soluble in alcohol, form permanent emulsions with water when "saponine" is added to their alcoholic solution. This property of saponine has been applied by this skilful chemist to mineral tar for the purpose of facilitating its use. I undertook to study the properties of this new preparation, and I now submit the result of my researches to the appreciation of the Academy of Sciences. I have assured myself by analysis, that alcohol separates from tar, phenic acid, benzine, naphthaline, analine, cumine, toluene, ammonia, and a little finely divided carbon. I have also assured myself, by numerous and varied experiments, that coal tar owes its principal properties to the first three of these substances. Alcohol, therefore, separates from coal tar its active principles. This solvent and saponine, add to it other properties. The action of alcohol, and its healing properties on wounds, are well known. Saponine, which possesses the property of absorbing fatty matters, of cleaning stuffs, and which acts in a very remarkable manner upon the skin, to which it gives a softness and freshness, becomes a powerful auxiliary in the numerous applications which may be made of it. In the healing of wounds, remarkably beneficial effects have been obtained by the use of emulsions, where saponine and coal tar have manifested their peculiar properties. The tar, whether mixed with inert powder, or whether incorporated with fatty substances, and applied in the form of a plaister, acts only on the surface of the wound. The watery composition of pus is the principal obstacle to the action of tar upon the tissues, in consequence of its insolubility in water. The good effects that have been obtained are due rather to its emanations, and not to itself. On the other hand, the powder of Messrs. Corne and Demeaux, which contains but from 2 to 4 per cent. of tar, allows only of a small quantity of this substance to be employed.

Phenic acid, the principle which acts with the greatest energy as a disinfectant, exercises a powerful action upon the tissues equivalent to that of a real burn; benzine is irritating, but the action of naphthaline is much softer, and it appears to possess sedative properties, and tempers, or rather modifies the impression of phenic acid and benzine. These properties of naphthaline joined to those of saponine make of coal tar a special compound. The liquid formed and the separation of the active principles of coal tar are not the only improvements which this preparation gives. Unlike tar, it penetrates the tissues, mixes with the pus and all the morbid secretions, and above all it contains 20 per cent. of the active principle of the tar. What an advantage above the powder of Messrs. Corne and Demeaux! What I have already stated establishes the fact, that the preparation of M. Lebeuf is not only coal tar in a more easy state for application, but is a new compound which owes to its composing parts, new properties.

My inquiry is divided into four parts—viz., first, the application to hy-

giene—second, to therapeutics—third, to natural history—and fourthly, in a series of experiments I studied the effects of saponined coal tar and of its components, comparatively, to ascertain and to explain its mode of action. The length of this work does not permit me to indicate the results I have obtained. The abstract will be found in the *Memoir* I have now the honour to submit to the Academy. I will only say here that the medical facts observed by me have been confirmed in France by a great number of hospital doctors, by M. Bouley, veterinary school of Alfort, in Belgium, and in Spain upon the wounded from Morocco.

DR. J. NORTHCOTE VINEN'S FORTNIGHTLY REPORT ON THE GAS SUPPLIED BY THE SURREY CONSUMERS COMPANY:—

Week ending.	Number of Observations.	Maximum Light. Candles.	Minimum Light. Candles.	Average Light. Candles.
January 12	4	13·53	11·70	12·54
„ 19	4	14·97	13·76	14·33

The volume of hydrocarbons amounted to 5 per cent.; carbonic acid, none. Ammonia was present on Jan. 9, 12, 17, and 18. The maximum pressure was 3 inches; the minimum, 4/10ths; the ordinary pressure ranged between 6/10ths and 9/10ths of an inch.

CONSUMPTION OF GAS IN PARIS.—The gas consumed in Paris in the year 1860 amounted to 2,477,021,471 cubic feet, against 2,225,429,758 cubic feet in the previous year; and the gas rental in 1860 was £660,584, against £603,356 in 1859. The increase in the year is, therefore, at about the rate of 11 per cent. In addition to this, the Portable Gas Company has a rental of nearly £34,000 per annum.

STOKE, FENTON, AND LONGTON GAS COMPANY.—The annual meeting of the shareholders of this company was held at the Town Hall, Stoke-upon-Trent, on Wednesday, the 23rd inst., presided over by F. W. Tomlinson, Esq., the chairman of the company. The advertisement convening the meeting having been read by the manager, the report of the directors was then submitted to the proprietors, which stated that, in consequence of the increase in the business of the company, it had been found necessary to reconstruct the works during the past summer on a much larger scale, and it was recommended that an increase in the capital should be now made by the issue of new shares, as provided for in the company's Act of Incorporation, to the extent of £5000. The accounts were read over and approved of, and the various resolutions were passed with unanimity, a dividend being declared of 6 per cent., free of income-tax. The meeting was then made special, and resolutions for the creation of the new capital were proposed and agreed to unanimously, every confidence being expressed in the security and good management of the undertaking.

GAS AND MUSIC.—We notice with much pleasure the success of the praiseworthy efforts of Mr. Leslie, the manager of the Avon Street Works of the Bristol United Gas Company, to improve the condition of the men employed in those works. In April last, he formed a musical band, consisting of twenty-four of the workmen, the instruments, which cost £110, being subscribed for by the men themselves. Under the instructions of Mr. Leslie, who officiated as honorary bandmaster, they have attained such a degree of proficiency that they are about to have a public concert, in the Victoria Rooms at Clifton, in aid of the band fund, under the patronage of the Mayor of Bristol, and the directors and officers of the gas company. The Clifton Vocal Association, and several local professional singers and musicians, have offered their services gratuitously, and the programme seems very attractive. The band, of course, take a prominent part, and will perform marches and several popular airs. The interest taken by the workmen of the station in the performances of the band is indicated by the issue to them of upwards of five hundred tickets for the concert. It is very gratifying to find that the exertions taken to improve the condition of the men by affording them pleasing means of recreation after their arduous labours, have been so successful, and are so well appreciated.

GASLIGHTS IN RAILWAY TRAINS.—A paragraph has recently gone the round of the papers, announcing that a very successful effort has been made, on the East Lancashire section of the Lancashire and Yorkshire Railway, to light the carriages of a passenger-train with gas. The invention is Mr. Newall's (the inventor of continuous railway breaks), and the gas is kept in a flexible receiver, in the guard's van. From the van, iron tubes carry the gas over the tops of the carriages, the connexion between the pipes on each carriage being made of flexible tubing. From the pipes over the tops of carriages, short suspenders drop into each compartment of the carriages, to which are attached neat brackets and glass globes. Thus, a flood of light, by which passengers may read comfortably, is obtained, and considerable warmth is imparted by the lamps, while all foul air escapes through the roof.

GAS LIGHTING IN HAVRE.—The *Journal de l'Eclairage au Gaz* announces that the European Gas Company has purchased the works of the rival French Company for the sum of £38,000. The subject was mooted at the last general meeting of the European Company.

GAS EXPLOSION NEAR HALIFAX.—One of these distressing calamities occurred recently at the residence of George Watkinson, Esq., wool-merchant, of Halifax, called Lower Brear, and situated a short distance from the Lancashire and Yorkshire Railway station, at Hipperholme. Not only was there considerable destruction of property, but Mr. Watkinson and a domestic servant were seriously injured. It appears that gas is made on the premises, and supplies most of the rooms in the house, which is a large one. The chandelier in the dining-room is rather faulty, and, when pulled down low, there is an escape of gas. On a Saturday night, the girl pulled it down below the safe point, and so left it. The gas was leaking out, therefore, for some hours; and, about two o'clock in the morning, Mrs. Watkinson awoke and smelt the gas. She awoke her husband, who went downstairs at once. He took every precaution to avoid the very serious consequences which, after all, followed. Doors and windows were set open, and kept so; and, when he thought all was safe, he took a light into the room. He applied it to the known faulty place, and in an instant there was an explosion, with a loud report. No doubt there had been a large accumulation of gas in the upper part of the room; and, as the night was perfectly still, this had not been disturbed by the precautions taken. The results of the explosion were serious. The windows of the dining and drawing-rooms, and of the library—all having one frontage—were driven out, and a great deal of valuable furniture was completely destroyed. To show the force of the concussion, it may be stated that one leg of a costly piano was taken right off. Moreover, the front wall of a newly-erected back kitchen was moved forward several inches. Mr. Watkinson himself suffered severely. His face and hands were scorched shockingly; it is more than probable that, if he had not had his hat on, he would have been fatally injured, for, being exposed to the utmost violence of the explosion, it was indented and twisted in all directions. The servant, who was in the room at the time, is also badly burnt, but not so much as her master.

EXPLOSION OF GAS AT THE WESLEYAN SCHOOLS, WESTMINSTER.—An explosion of a fearful character, and which was well nigh attended with serious consequences to life and property, happened on Saturday, the 19th inst., in the immense pile of premises belonging to the Wesleyan connexion, and termed the Wesleyan Collegiate and Training Schools, situate in the Horseferry Road, Westminstr. The building is divided into sundry compartments, including dormitories, class-rooms, lecture halls, &c. From the particulars obtained, it appeared that a strong smell of gas escaping had been experienced during the day in No. 1 Class-room, but from what part, could not be correctly ascertained, when a man foolishly took a lighted candle, to look for the spot where the leakage had occurred. The gas that had escaped from the pipes having accumulated in the room, the moment the light was taken in, the vapour became ignited, and exploded with a noise resembling a clap of thunder. The concussion was so great that the man was prostrated, the maps and other things in the room set on fire, and from forty to fifty squares of glass blown from the windows. Several of the gentlemen connected with the establishment, and many of the neighbours hastened to the building, as well as Mr. H. Campbell with the trigade engine from the contiguous station; and, owing to their joint exertions, the fire was prevented from extending beyond that part of the establishment in which the explosion happened, which was fortunate; for, had the flames extended to the other floors, the loss of property would have been great.

THE PIG-IRON TRADE.—In addition to the particulars given in the last JOURNAL, with regard to the Scotch pig-iron trade, it may be interesting to refer briefly to the development of kindred industry in England and Wales. The number of furnaces in the South Staffordshire district is 193; in Shropshire, 32; Forest of Dean, 8; North Staffordshire, 31; Northumberland and Durham, 98; Lancashire and Cumberland, 23; Yorkshire, 20; Northamptonshire, 4; Wiltshire, 5; Derbyshire, 24; South Wales, 203; North Wales, 15; making a total of 656, or, including 175 in Scotland, 831. Of these, 563 furnaces are now in blast, and the annual production is estimated at 4,560,300 tons. Stocks have largely accumulated, and trade is consequently depressed.

Price Current.

CASTINGS, PER TON.

Average Weight of Cast-Iron Gas-Pipes, per Yard.

1¼ in.	2 in.	2¼ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lbs.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow.	Newcastle.	Wales.	Yorkshire, Derbyshire, and Staffordsh.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Pig Iron, No. 1	3 5 0	2 10 0	2 12 6	3 0 0	3 5 0
1¼ and 2 inches Socket-Pipes	7 0 0	6 0 0	6 5 0	6 10 0	6 15 0
2½ and 3 „ „	6 10 0	5 10 0	5 15 0	6 0 0	6 5 0
4 and 5 „ „	6 0 0	5 0 0	5 5 0	5 10 0	5 15 0
6 in. and upwards „	5 15 0	4 15 0	5 0 0	5 5 0	5 10 0
Retorts, 1st fusion, hot blast	5 10 0	4 10 0	4 15 0	5 0 0	5 5 0
„ 2nd „ cold „	6 10 0	5 5 0	5 10 0	6 0 0	6 5 0
Tank Plates, ⅛ thick and above	6 0 0	5 0 0	5 5 0	5 10 0	5 10 0

WROUGHT-IRON TUBING,

Subject to 40 per cent. Discount.

	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent Welded Tubes, from 2 to 12 ft., perft.	1 8	1 0	0 10	0 7	0 5	0 4½
„ „ „ 6 in. to 18 in., each	3 0	2 0	1 9	1 3	1 0	0 9
Connecting-Pieces, or Long Screws	3 6	2 3	2 0	1 6	1 2	0 11
Bends, Springs, and Elbows—wrought iron	3 9	2 3	1 9	1 0	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 10
Crosses, wrought or cast	4 6	3 0	2 6	2 0	1 6	1 2
Iron Cocks	17 6	9 6	7 6	4 6	3 3	2 6
„ with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing Sockets, Caps, Plugs, and Plain Sockets (Nipples	1 3	0 9	0 8	0 6	0 5	0 4
	1 0	0 8	0 7	0 5	0 4	0 3
Syphons, 2 quart	15 0	14 0	13 6	13 0	12 0	—

COALS, PER TON.

Newcastle.—Unscreened.	6s. 9d.
Whitwell Primrose	
Medomsley, Eighton Moor, and Burnhope	7 0
Pelaw	7 3
New Pelton, Peareth, South Pelaw, Washington Hutton, and South Peareth	7 6
Pelton	7 9
Ramsay's Newcastle Cannel	16 0

Scotch Cannel.	
Boghead, at Leith	45s. 0d.
Kirkness, best	23 0
Capeldrae, 1st quality	20 0
„ 2nd „	12 6
Lesmahago, at Glasgow	25 0
„ „ Leith	27 6
Arniston	27 6
Wemyss	20 0
Knightswood	18 0
Pirnie	15 0

FREIGHTS.

Coastwise—Newcastle.—Per Ton.	8s. 9d.
Chatham & Rochester	
Cork	12 0
Dover	8 0
Dublin	12 6
Exeter Quay	11 6
Folkestone	8 0
London (Pool)	7 3
Lowestoft & Yarmouth	6 9
Lynn	—
Portsmouth	10 6
Plymouth	11 0
Ramsgate & Margate	8 0
Whitstable	7 0
Weymouth	—

Foreign.—Per Keel.	
Boulogne and Calais	£10 0 0
Barcelona	23 0 0
Bordeaux	15 0 0
Cadiz	15 0 0
Copenhagen	11 0 0
Dieppe	11 10 0
Genoa	22 0 0
Hamburg	—
Havre	12 10 0
Leghorn	22 0 0
Lisbon	17 0 0
Rotterdam	—
Stettin	10 0 0
Trieste & Venice	24 0 0

SUNDRIES.

Best Newcastle Fire-bricks	per 1000	50s. 0d. to 55s. 0d.	
Cliff's Fire-bricks, at Wortley	per 1000	55 6	
Ingham's Fire-bricks, at Wortley	„	55 0	
Fire-clay Retorts	per foot run, 5s. 6d. to	7 0	
Tough Cake Copper ... per ton	£102 10s.	Foreign Spelter ... per ton	£18 7 6
English Pig Lead ... „	21 10	English Block Tin ... „	128 0 0
Welch Bar Iron, in London „	7 0 0	Banca ... „	127 10 0
Tarred Rope Yarn	per cwt.	26s. 0d.	

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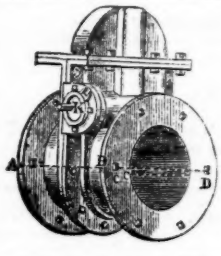

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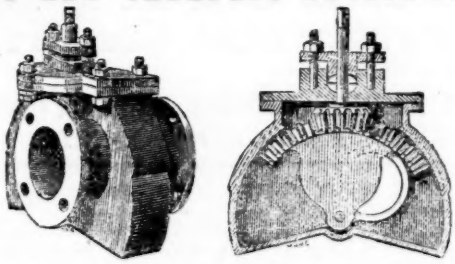

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HOLDERS, when Trussed upon scientific principles, are more capable of resisting strains, in every direction, than Cast Columns of any form can be; and weigh only one-fifth as much as the latter. Designs and Working Drawings for Guides and Ties can be obtained of the Inventor, CHARLES DIXON, C.E., Chichester, SUSSEX.

GAS COAL.

BEAL, WALKER, and CO., Coal and

COKE MERCHANTS, No. 1, Walker's Buildings, SHEFFIELD, beg to inform the Directors and Managers of Gas Companies, that they are in a position to contract for the supply of the different sorts of best Gas Coal, such as best Silkstone, Barnsley, and others, at the lowest prices, which may be had on application at the above Office.

ALFRED PENNY, Gas and

CONSULTING ENGINEER,

WENLOCK IRON WORKS,

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Mr. PENNY having had a large experience in the construction, alteration, and management of Gas-Works, begs to inform the Directors of Gas Companies that he may be consulted on all matters appertaining thereto. He also manufactures Gasholders, Purifiers, and all the various apparatus used in Gas-Works, and keeps in stock Retorts and Mouthpieces, Socket-Pipes, Bends, Branches, T-pieces, &c. &c.

Plans, Specifications, and Estimates prepared.

JOSEPH WILLCOCK

(late BARLOW and CO.),

Mechanical and Architectural Draftsman, Designer, Surveyor, and Lithographer to Gas Engineers and Gas Apparatus Manufacturers, formerly Superintending Engineer at the largest Gas Apparatus Manufactory on the Continent.

Patent and Designs Office, 89, Chancery Lane, LONDON, W.C.

GEORGE ANDERSON, Gas and

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DIRECT-ACTING GAS-EXHAUSTERS,

supplied either with or without Steam-Engines and Boilers.

FOUR-WAY DIAPHRAGM VALVES,

one of which answers the purpose of THREE ordinary Valves, as applied to Purifiers, or in shutting off and passing Station-Meters, Governors, or other apparatus, while the Connecting-Pipes are also much simplified.

RETORT SETTINGS,

designed to be heated by Tar alone, and with a total absence of Smoke.

Illustrated circulars, giving references and every information, may be obtained on application as above.

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Manufacturer of every description of Fire-Bricks, Lumps, Quarries, Shields, Flue Covers, &c., to any size or shape required.

FIRE-CLAY RETORTS,

TO MODEL OR DRAWING.

B. G. begs to call the attention of Gas Companies to his Fire-Clay Retorts, which have been used with great satisfaction in some of the largest Gas-Works in the Metropolis and many Provincial Towns in England.

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WORTLEY FIRE-BRICK AND RETORT WORKS,

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W. INGHAM and SONS, having for many years been extensively engaged in the Manufacture of
RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY,
beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.
The Works are of such magnitude as to ensure the prompt execution of orders to any extent.

Estimates for Setting, or Bricklayers sent when required.

GAS OVENS IN SEGMENTS OF EQUAL QUALITY.

A large stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all sizes kept in London at CHRISTIE & CO.—Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.

N.B.—*Export orders continue to have prompt attention.*

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ORLANDO BROTHERS,

MANUFACTURER OF PATENT CLAY RETORTS,

AND EVERY DESCRIPTION OF

TUBULAR GLAZED SEWERAGE PIPES, BENDS, JUNCTIONS, ETC.

FIRE-BRICKS, TILES, BLOCKS, AND CHIMNEY-TOPS.

WILLIAM PARKINSON AND CO.,

(SUCCESSORS TO THE LATE SAMUEL CROSLEY,)

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Established 1816.

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STATION-METERS & GOVERNORS,

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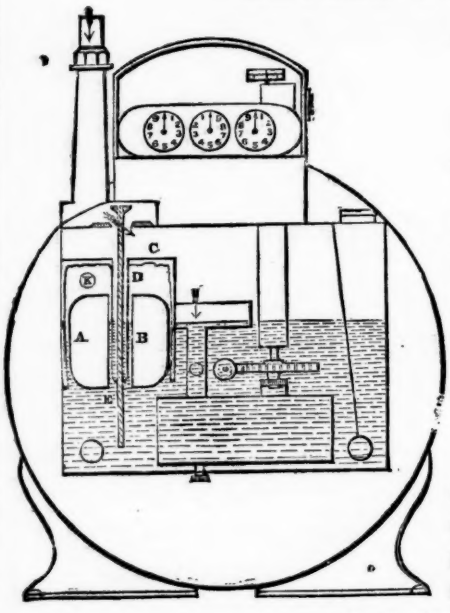
AND OTHER GAS APPARATUS. Also,

METERS FOR MEASURING WATER.



IMPROVED LOW-SPOUTED GAS-METER,

WITH

NEW PATENT FLOAT ARRANGEMENT.

The Float A is partitioned off from the front frame considerably below the water-line, and is pierced perpendicularly by a tube B.

A large gas-way, C, is left between the top of the partition and the valve-seat. The small tube D, in which the float-wire works, is fixed to the top of the partition, and comes down below the water-line inside the tube B. The float-wire is soldered to the float at E, so as to allow water to pass into the tube D, in order to seal it. The chamber above the float is open to the outlet through the hole K.

The action of this float is exactly opposite to that of ordinary meters. The float is elevated by sudden pressure, and the valve cannot be closed except through want of water.

W. P. and Co. beg especially to call the attention of Gas Companies and others to this New Patent Meter, which entirely overcomes the difficulty experienced by ordinary wet meters, owing to the short range of the float, which is necessary in order to meet the requirements of the "Sale of Gas Act."

They are prepared to supply

TEST GASHOLDERS,

of the most approved description, graduated by the Standard.

CROSLEY & GOLDSMITH'S

PATENT SELF-ADJUSTING & COMPENSATING GAS-METERS

CANNOT BE OVER OR UNDERCHARGED WITH WATER,

and they consequently register the quantity of Gas consumed with greater accuracy than Meters in which the Water-Line is variable.

MANUFACTURED BY

CROSLEY & CO.,

GAS-METER MANUFACTURERS,

103, SOUTHWARK BRIDGE ROAD, LONDON, S.E.

N.B. The Patent Self-Adjusting and Compensating Apparatus may be applied to the ordinary Meter.

Manufacturers of LOWE'S PATENT MOTIVE-POWER METER, for situations where there is an inadequacy of pressure to supply the special requirements of certain consumers in low grounds during the day or night.

Also, Manufacturers of EXPERIMENT METERS, GOVERNORS, MINUTE-CLOCKS, PHOTOMETERS, &c., &c., similar to those used by Mr. King, of Liverpool.

CROSLEY & CO. are also prepared to supply Gas Companies and others with

DUPLICATES of Mr. KING'S CUBIC FOOT TRANSFERRER,

similar to that manufactured by them, and verified by the ASTRONOMER ROYAL, and PROFESSOR MILLER, of Cambridge, on behalf of the Government, which was deposited by C. & Co. in the Office of the COMPTROLLER-GENERAL of the EXCHEQUER before Nov. 13, 1859, in compliance with the "Act for Regulating Measures used in Sales of Gas." They also supply

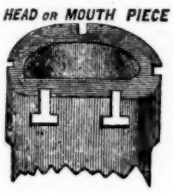
TEST GASHOLDERS,

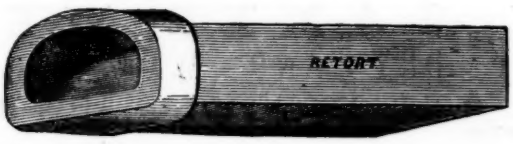
Graduated by the Standard Cubic Foot.

C. and Co. are the only house in the trade which has for years manufactured Meters according to the standard measure set forth in the 2nd Section of the "Sale of Gas Act," and which also comply with the rules laid down in the Section for testing meters. Purchasers of C. and Co.'s Meters may therefore be secured against any additional expenses being incurred in order to adapt their Meters to the requirements of the new Act.

KING BROTHERS,

STOURBRIDGE FIRE-BRICK AND RETORT WORKS.





KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them FREE FROM CRACKS AND CORRECT IN FORM. By great care in Manufacturing, combined with the advantages in burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonize.

Retort Ovens, Fire-Bricks, Guards, Saddles, Rabbitted Burs, Flues, and Quarries, are all Manufactured of the same quality of Clay.

Every Retort and Brick is branded "King Brothers, Stourbridge."

WILLIAM SUGG,

MANUFACTURER OF

PATENT DRY AND WATER GAS-METERS, TEST GASHOLDERS, AND APPARATUS,

"EVANS'S" PHOTOMETERS,

Experimental Meters, Minute Clocks, &c., Station Meters and Governors,

STREET-LAMP GOVERNORS AND LAVA BURNERS,

19 and 20, MARSHAM STREET, WESTMINSTER.

FIRE-CLAY RETORTS.

JOHN SWARBRICK,

MANUFACTURER OF PATENT COMPOSITION CLAY RETORTS,

FIRE BRICKS OF EVERY DESCRIPTION, SHAPE, AND SIZE, &c. &c.

HIGHER EANAM, BLACKBURN, LANCASHIRE.

These RETORTS are generally used in the Gas-works of Preston, Accrington, Bury, Heywood, Middleton, Rochdale, Ratcliffe; the Mills of Messrs. Horrocks, Miller, and Co., Preston, &c. &c., and are unequalled in having afforded general satisfaction to those who have given these Retorts a trial.

To meet the increasing demand, the Works at Little Harwood have been greatly enlarged; and Gas Engineers who may favour with an Order may rely with confidence on their being promptly supplied with an article not to be surpassed in finish or durability.

PRICES MODERATE.

SALE OF GAS ACT.

MESSRS. CROLL, RAIT, AND CO.,

Manufacturers of Croll's Patent Improved

DRY GAS-METER,

Also Manufacture and Supply

TEST GAS-HOLDERS,

And other Apparatus required by the Inspectors appointed in pursuance of the above Act.

Application for particulars to be made to the Factory,

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CONSUMERS' COMPENSATING & NON-COMPENSATING WET GAS-METERS,

Of the best material and workmanship, carefully adjusted to meet the requirements of the SALES OF GAS ACT.

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WRIGHT'S REGISTERING PRESSURE-GAUGE, EXHAUSTER REGISTER, & REGULATOR;

STANDARD TEST GASHOLDERS;

Consumers' Governors; Inspectors' Pocket, King's, and all other kinds of Pressure-Gauges; Thermometers for Condensers, Pressure Registers, &c., &c.

EXPERIMENTAL TESTING APPARATUS,

Employed by the best experimenters in this country and on the continent, and by the Gas Testers in the London districts.

PHOTOMETERS, SPECIFIC GRAVITY APPARATUS, BI-SULPHURET OF CARBON TEST, THOMPSON'S BROMINE AND HEATING POWER OF FUEL TESTS, IMPROVED ALKALIMETER, EXPERIMENTAL METERS AND GOVERNORS, MINUTE CLOCKS, &c., &c.

"Analysis of Gas for Practical Men," by A. WRIGHT, M. Inst. C.E., post-free for 13 Stamps. PRICE-LISTS ON APPLICATION.

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PATENT DRY AND WET GAS-METER MANUFACTURER,

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ESTABLISHED 1836.

J. M. invites attention to his Improvements in **EXPERIMENTAL WET GAS-METERS**, by which he renders impossible any Leakage from the Stuffing-Box.

These **METERS** are **GUARANTEED** to meet all the Requirements of the **SALE OF GAS ACT**

GOVERNORS, STATION-METERS, PHOTOMETERS,

EXPERIMENTAL TESTING GASHOLDERS, HIGH-PRESSURE GAUGES,

AND ALL APPARATUS IN USE AT THE GAS MANUFACTORY.

D. HULETT and CO., 55 and 56, HIGH HOLBORN, LONDON,

PATENTEES and MANUFACTURERS of the ONLY GOOD MERCURIAL GAS REGULATOR,

invite the attention of Gas Companies and the Trade generally to their Improved GAS-METERS, which they warrant equal to any in Quality, Workmanship, and Simplicity of Construction, and the only Meters from which Gas cannot be obtained without being duly registered.

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GAS CHANDELIERS, GLASS LUSTRES, HALL LANTERNS, VESTIBULES, BRACKETS, PENDANTS;

DOUBLE CONE, ALBERT, SHADOWLESS, & EVERY DESCRIPTION OF BURNER, UNION JETS, BATSWINGS, ETC.;

IMPROVED FULL-WAY CARTER'S VALVES (much approved of);

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CAST & WROUGHT-IRON PIPE, BLACK & GALVANIZED. COPPER, TIN, BRASS, & COMPOSITION TUBING.

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